WEST VIRGINIA'S

NONPOINT SOURCE MANAGEMENT PLAN

2000

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December 2000

Management plans for the Nonpoint Source Programs within the following West Virginia state agencies.

West Virginia Division of Environmental Protection
- Office of Water Resources
- Office of Mines and Minerals
- Office of Oil and Gas

West Virginia Soil Conservation Agency
West Virginia Division of Forestry
West Virginia Division of Health

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MISSION STATEMENT

TO IMPLEMENT DYNAMIC AND EFFECTIVE NPS PROGRAMS TO ENHANCE AND PRESERVE THE PHYSICAL, CHEMICAL AND BIOLOGICAL INTEGRITY OF SURFACE AND GROUNDWATERS, CONSIDERING NATURE AND THE HEALTH, SAFETY, RECREATIONAL AND ECONOMIC NEEDS OF HUMANITY, WITH A FOCUS ON A WATERSHED MANAGEMENT APPROACH.

I. EXECUTIVE SUMMARY

The West Virginia Nonpoint Source Management Program Update summarizes changes since release of the 1989 NPS Management Program, which was approved by the U.S. Environmental Protection Agency (EPA) and describes how the state will address Nonpoint Source (NPS) pollution problems. Land use control and technology-based best management practices (BMPs) are the tools most widely used for controlling NPS pollution and protecting designated uses of water bodies.

This Nonpoint Source Management Program Update fulfills the requirements of the Water Quality Act of 1987 by identifying statewide NPS programs, listing BMPs used to reduce pollution loadings and outlining an action plan to implement the program. These Program components have been considered for the following categories of NPS pollution: agriculture, construction, silviculture, resource extraction, hydrologic/habitat modification, urban runoff, land disposal. Programs and plans are also presented for wetlands, groundwater and other NPS related efforts, such as educational initiatives. A section has been added to describe how West Virginia's NPS Program incorporates the nine key elements of an effective state program as delineated in the FY97 NPS Program Guidance from EPA headquarters. In brief, West Virginia's Program has established and makes timely revisions to, an explicit set of goals, objectives and actions to restore and protect surface and ground water from a NPS standpoint. This detailed guidance is established for both the contributing group of diverse agencies that deal with NPS issues state-wide and for individual watersheds under the Watershed planning process.

II. INTRODUCTION TO NONPOINT SOURCE MANAGEMENT

Nonpoint Source (NPS) pollution is commonly described as man induced pollution contained in stormwater or snowmelt runoff from land surfaces. The pollution can impact surface waters as well as groundwater and comes from diffuse sources, in contrast to "point" source pollution, which is discharged through a pipe. Most point sources are from industrial, commercial or municipal discharges.

Typical examples of activity which contribute to nonpoint source pollution are runoff from cropland, animal feedlots, urban areas, construction sites, abandoned mining operations, logging roads, failing septic tanks, landfills, salted winter roads and removal of streamside vegetation. The most typical nonpoint source pollutants are sediment, nutrients, pesticides, bacteria, oil and grease, metals and thermal variations. Recent studies and surveys by EPA and State water quality agency's, indicate that the majority of the remaining water quality impairments in our nation's rivers, streams, lakes, estuaries, coastal waters and wetlands result from nonpoint source pollution.

III. REQUIREMENTS OF SECTION 319 (h) OF THE CLEAN WATER ACT

In 1987, in view of the progress achieved in controlling point sources and the growing national awareness of the increasingly dominant influence of nonpoint source pollution on water quality, Congress amended the Clean Water Act to focus greater national efforts on nonpoint sources. In the Water Quality Act of 1987, Congress amended section 101, "Declaration of Goals and Policy, " to add the Following fundamental principal:

"It is the national policy that programs for the control on nonpoint sources on pollution be developed and implemented in an expeditious manner so as to enable the goals of this Act to be met through the control of both point and nonpoint sources of pollution."

To further this objective, Congress enacted Section 319 in the Water Quality Act of 1987, Which established a national program to control nonpoint sources of water pollution. Under Section 319, States must assess nonpoint source pollution problems and causes within the State and adopt and implement management programs to control the nonpoint source pollution. Section 319 authorizes EPA to issue grants to States to assist them in implementing those management programs or portions of management programs that have been approved by EPA.

The implementation of State's Section 319 NPS Management Programs is a continuous process and must account for available resources, emerging problems, institutional changes and implementation progress.

The NPS Management Program emphasizes management strategies and programs to address nonpoint source problems. The NPS Management Programs are balanced between two priorities. One priority is to implement, on a generally applied statewide basis, the overall NPS Program that includes enforcement of regulations, technical and financial assistance and educational efforts. A second priority is narrower and involves targeting specific watersheds to either improve degraded water quality or minimize nonpoint source impacts to high quality waters.

The NPS Management Program Update is to include an identification of programs to achieve implementation of BMPs. More specific discussion of the state and local programs can be found in referenced documents. The purpose of this document is to present an update of the federally required state management program for nonpoint source control in West Virginia.

IV. NONPOINT SOURCE STATEWIDE MANAGEMENT AGENCIES

The West Virginia Division of Environmental Protection Office of Water Resources was designated by Certification from the State Attorney General, to be the lead Agency in the state for the Nonpoint Source Program on October 27, 1989.

Subsequent to the 1989 approval of the Nonpoint Source Assessment Report and Management Program, a significant amount of administrative and coordinative effort was required to effectively establish the NPS Program as a viable entity. This required a high degree of visibility for both the headquarters administrative staff as well as the field coordinators. The Management Program components, while primarily oriented toward implementation by the cooperating agencies, must be managed through the Offices NPS staff to insure a consistent statewide effort. Just as importantly, the staff must provide the cooperating agencies guidance and support in concentrating their implementation efforts in the identified priority watersheds. It is the lead agency's responsibility to maintain and update the NPS Assessment Report and Management Program Plan. It is also the lead agency's responsibility to promote and oversee the NPS program statewide and intrastate. This is accomplished by utilizing information/education, technical assistance, financial assistance, demonstration projects, public participation, monitoring and regulatory enforcement as described in Chapter II of the Nonpoint Source Management Plan, August 1989.

In order to maintain effective management programs, the Office of Water Resources utilizes the cooperation of agencies with program authority and a long tradition of decentralized delivery systems. As a result, the West Virginia State Soil Conservation Agency, Division of Forestry and Division of Environmental Protection agree to serve as cooperating agencies in developing and implementing the agricultural, construction silviculture and resource extraction management plans.

Committees also were formed to provide technical advice with specific problems. The committees provided the basis for development of Best Management Practices (BMP's) to solve for control problems and participated in developing the implementation plans for each category.

Each of the management plans identified objectives designed to increase the understanding and awareness of the affected industries in each category to their responsibilities in protecting water quality during their operations. While the ultimate intent of the program is to protect water quality for beneficial uses, the agencies recognized that this objective could only be attained if the goals of the management plan were reasonable and responsible.

The following broad goals were established for the state's comprehensive nonpoint source management effort: (See pages 28 & 29)

1. To continue to assess the impact of the nonpoint sources on the surface and ground waters of the state and to identify specific causes of nonpoint source pollution to evaluate the effectiveness of the implementation program.

2. To implement and update the nonpoint source assessment document and the management program plan as necessary and to suggest cost effective solutions and activities. Every effort will be made to make reasonable and effective use of the limited resources available to mitigate pollution problems.

3. To achieve, maintain and protect state water quality standards for surface and ground water and to seek realistic improvement of water quality where standards are not met.

4. To Provide a balanced program of statewide nonpoint source program initiatives based upon education, technical assistance, financial incentives, demonstrations and regulation.

5. To reduce nonpoint source loading to the state's waters and to preserve the designated uses for which water quality standards have been established.

The West Virginia Nonpoint Source Program through each category's management plan has a structure that is well defined. Yet it also is adaptable to changing needs. Implementation strategies in the program has included increased emphasis on projects of statewide importance that coordinate and focus federal and state agencies on environmental improvement efforts; educate industry, government and the general public on nonpoint pollution; develop watershed projects to address nonpoint sources; increase citizen awareness and involvement in monitoring streams; involve biological monitoring to assess impacts and improvements; and increase emphasis on noncompliance with enforcement of available water quality standards and regulations.

Traditional nonpoint source categories covered by West Virginias program included agriculture, construction, silviculture and resource extraction. Through the updating of the Management Plan the categories covered will be expanded. The following nonpoint source categories will be addressed:

Agriculture
Construction
Silviculture
Land Disposal/On Site Disposal
Resource Extraction
Hydrologic/Habitat Modification
Urban Runoff

The primary state agencies that have become partners in coordinating the West Virginia Nonpoint Source Program include the following:

- The West Virginia Division of Environmental of Environmental Protection - Office of Water Resources is the designated lead Agency in the state for the Nonpoint Source Program.

- West Virginia Soil Conservation Agency; The West Virginia Soil Conservation Agency serves as the cooperating agency in developing and implementing the agricultural and construction management plans.

- West Virginia Division of Forestry; the West Virginia Division of Forestry serves as the cooperating agency in developing and implementing the silviculture management plans.

- West Virginia Division of Environmental Protection - Office of Abandoned Mine Lands; the Office of Abandoned Mine Lands serves as the cooperating agency in developing and implementing the resource extraction management plans.

- West Virginia Division of Environmental Protection - Environmental Advocate Office; the Environmental Advocate Office serves as the cooperating agency in developing and implementing the public involvement section of the management plan

- The West Virginia Division of Environmental of Environmental Protection – Coordinates the Watershed Management Framework through the Watershed Basin Coordinator presently located within the Office of Water Resources.

- The United States Environmental Protection Agency- the Region III Office in Philadelphia, Pennsylvania provides guidance and financial assistance.

- The United States Department of Agriculture-the Natural Resources Conservation Service provides additional technical and financial assistance the agricultural programs

V. WV WATERSHED MANAGEMENT FRAMEWORK PROGRAM

The WV Watershed Management Framework describes a process that involves many local, state, and federal agencies, citizens, environmental agencies, businesses, industry, and academia to work together to protect and restore the state's waters. The state has thirty-two (8-digit) watersheds which have been split into five groups (A through E). The process consists of five phases whereby each group of watersheds is in a different phase of the process. For example, when Group C is beginning with Phase 1, Group B is in Phase 2 and Group A is in Phase 3.

Phase 1: Scoping and Screening (Conduct initial public outreach to identify problems and issues. Compile existing data. Conduct screening

monitoring and analysis. Prepare hydrologic region status reports. Determine priority watersheds and issues.)

Phase 2: Strategic Monitoring and Assessment (Develop strategic monitoring plans for priority watersheds. Implement strategic monitoring. Conduct water quality assessment.)

Phase 3: Management Strategy Development (Develop and assess integrated management strategies, including TMDLs.)

Phase 4: Priority Watershed Management Plan (Develop and finalize management plans (who does what, when, where, and how.)

Phase 5: Implementation (Implement point and nonpoint source management strategies.)

During the Framework process watersheds are assessed and prioritized based upon water quality data and information, water uses, public participation and interests, agencies' participation, interests, and programmatic mandates, and ongoing activities. Watersheds are prioritized on the subwatershed (11-digit) level. Once a number of subwatersheds are targeted, these watersheds are evaluated to determine where additional monitoring may be required to determine sources of the water quality issue that needs addressed. These watersheds are further assessed for protection and restoration purposes based on additional information that is gathered. These subwatersheds are once again evaluated and prioritized to determine which areas will have management strategies developed. During this next phase, watershed restoration action strategies (WRAS) are developed through local stakeholder involvement. The strategies identify what the water issues are, who needs to become involved and what types of activities need to occur, and potential funding sources. From these strategies a watershed management plan is developed as the compilation of project proposals which set specific goals, funding sources and implementation plans. The plan will identify all the partnerships, projects, funding sources, follow-up monitoring, and timeline. A plan can be based on a WRAS or a TMDL (or both) and more clearly defines the specific responsibilities of each stakeholder group in implementing efforts to restore a watershed to compliance with water quality standards.

Throughout the Framework process, public participation and involvement is promoted and encouraged. The process begins with an initial public outreach, going into the watershed and holding public meetings to determine where and what issues and concerns the meeting participants have within the watershed. This information is used to learn where there may be public interest and support, as well as, what streams the Watershed Assessment Program (WAP) should assess during their watershed monitoring. The public can also be involved when WAP develops its sampling site locations. Public interest and potential participation is also a factor weighed into prioritizing watersheds. The public may participate in strategic monitoring and assessment to help in determining water quality issues and their sources and then to help in developing watershed management strategies. To be able to implement these strategies, all available funding sources and opportunities are pursued. This includes resources from industries, business, private groups, government, etc. Finally, the public will be involved in the implementation of the plans that they helped create.

The Framework process allows for public input and involvement throughout the process. The public is a part of the process and has a stake in what occurs in their watershed from the beginning to the end. This will promote community awareness and pride.

The Framework process acts as a guide and a planning tool to help all watershed management programs focus their resources in specific areas at specific times so that all issues within a watershed can be addressed during the same time period and decisions can be made based on everyone's information. This will decrease the duplication of efforts, improve public participation and awareness, data management, and the overall efficiency and effectiveness of the state's watershed management programs which are housed in many different government agencies. The Framework is a process for the integration of programs that already exist and that already work towards the protection and restoration of the state's waters.

During the next year (May 2000-June 2001) the following activities will occur:

- Group A Public outreach meetings and watershed assessment activities
- Group B Watershed Management Strategies will be development for the five prioritized subwatersheds (Little Sandy Creek and Blue Creek of the Elk River watershed; Pecks, Fink, and Upper Buckhannon of the Tygart Valley River watershed), watershed management plans (projects) will be created, and implemented in 2001.
- Group C Information will be compiled and assessed and hydrologic region status reports will be written, subwatersheds will be prioritized, management strategies will be developed and watershed management plans will be created for implementation in 2002.
- Group D Information will be compiled and assessed and hydrologic region status reports will be written, subwatersheds will be prioritized, and management strategies will be developed.
- Group E Watershed assessment program will work with others to assess the watersheds and this information will be analyzed and compiled to begin development of the hydrologic region status reports.

The long term goals of the Non Point Source Program will be in concert with the Watershed Management Framework schedule.

Program integration is on-going with all the nonpoint source agencies. The TMDL program has developed a TMDL Action Plan that is based upon the framework cycle and its schedule for the development and implementation of TMDLs.

VI. COORDINATING REVIEW BOARD

Due to the number of State agencies involved in coordinating and/or regulating nonpoint sources, the various technical advisory committees must assure that State Requirements are understood and met. This is important since funding sources, other than National Clean Water Act, Section 319 funds, are available to support

implementation of BMP's. To maximize utilization of these funds, requirements of the various agencies that manage the funds must be addressed during the evaluative, priority watershed selection, planning and implementation phases.

This requires an interagency mechanism to allow review of individual agency requirements and to discuss conflicts in objectives for specific types of nonpoint source prevention. Therefore, an interagency NPS Coordinating Review Board made up of representatives from each of the NPS Technical Advisory Committees has been created to integrate the efforts of all category agencies into a unified NPS watershed management approach. It will be the responsibility of the Coordinating Review Board to guide implementation, identify specific BMP's for multi category targeted watersheds and resolve conflicts in accordance to meeting Section 319(b)(2)(F) Federal Consistency requirements.

VII. FEDERAL CONSISTENCY OF THE NPS MANAGEMENT PROGRAM

Many of the assistance programs, development projects, and land facilities management activities administered by Federal agencies have the potential to cause nonpoint source pollution impacts to the nation's waters. However, many of these same activities, when properly administered, have a great potential for supporting and advancing State NPS water pollution management efforts.

The Federal consistency provisions of Section 319 of the Clean Water Act represent an opportunity for the States and Federal agencies to more closely coordinate their activities and cooperate in the achievement of clean water goals. These provisions enable States to review federal activities for consistency with the State's approved NPS Management Program. If the State determines that an application or project is not consistent with the provisions of its NPS Management Program, the Federal agency must make efforts to accommodate the State's concerns.

The principal federal consistency review mechanism is through the State's intergovernmental review process established pursuant to Executive order 12372. States can also utilize the National Environmental Policy Act (NEPA) environmental review process, the A-106 pollution abatement process, and any other existing review mechanisms, including those of the various federal agencies.

The success of the Federal consistency review process depends largely on the ability of States and Federal agencies to implement the requirements in an open, cooperative manner. Through early notification, effective communication, and negotiations, States and Federal agencies can make the consistency review process an effective tool for achieving commonly shared clean water goals.

West Virginia has an intergovernmental review process that is consistent with Executive order 12372. This process provides for the review of Federal financial assistance programs and federal development projects for their consistency with the state NPS Management Plan.

Sponsors of projects requiring intergovernmental review shall submit the applications to the state clearinghouse, the Community Development Division of the Governor's Office of Economic and Community Development at least 30 days prior to the submission to the Federal Agency. The state clearinghouse project applications which impact the NPS Management Programs to the NPS lead agency, Division of Water Resources for proper disposition.

As the water resources agency, the Division is responsible for insuring that the water resources of the State are managed for the benefit of its citizens. This function includes review and comment on projects which may impact the quality and quantity of the resource. Applications for permits to the Federal Energy Regulatory Commission (FERC) for hydroelectric generating facilities and pipeline installation/replacement projects are routinely reviewed to insure protection of the affected resource. Also, National Wild and Scenic river proposals, federal Environmental Impact Statements, U.S. Soil Conservation Watershed projects and National Park projects are other examples which must be reviewed and commented on for water quality and water resource impacts. Projects that may involve impacts to wetlands will receive particular attention to insure protection of that sensitive resource. All reviews are coordinated with other state agencies involved.

Additional reviews are made of Environmental Assessments for federal projects that are under the NEPA requirements that are not always processed through the clearinghouse; such as abandoned mine lands reclamation projects that are federally funded through the West Virginia Division of Energy, scientific and technological research, etc. These processes are further described in the section, Federal Consistency Review Processes.

Any additional federal assistance activities that are identified as not meeting the consistency requirement of Section 319 will be incorporated into the review process during the four years of the NPS program plan.

The process for conducting Federal Consistency reviews will follow the following general guidelines:

1. The extent to which the project is consistent with the NPS Management Program, including the Management Program's goals, policies, programs, plans and activities.

2. The extent to which the project will comply with applicable pollution control standards embodied in the Management program, including:

    a. Water quality standards, including beneficial uses, the numeric and narrative criteria established to support these uses, and the State's antidegradation policy:

b. Requirements for implementation of BMP's and other pollution control measures;

c. Any statutory, regulatory or administrative requirements, such as permits, monitoring, or prohibition of activities under certain conditions.

3. The extent to which the project duplicates, runs counter to, or needs to be coordinated with other projects or activities affecting the area's water resources.

4. The extent to which the project may support, enhance or contribute to the fulfillment of the State's NPS Management Program.

Reviews will consider not only direct effects of the activity, but also indirect effects and
Cumulative impact also may consider consistency not merely with enforceable, mandatory provisions of the management program but also with non-mandatory provisions such as goal statements, policies and recommendations.

Conflict Resolution

When continued negotiations between the State NPS lead agency and a Federal Agency do not result in issue resolution, the lead agency will notify the EPA Region III Office. EPA Region III will work with the State NPS lead agency and the appropriate Federal agency to attempt resolution of any issues or conflicts in a manner that is mutually acceptable to the State and Federal agency.

When the EPA is unable to negotiate a mutually acceptable accommodation between the State and the Federal agency, the regional office will inform EPA Headquarters in writing. EPA Headquarters will notify the regional office of the concerned Federal agency and will attempt to negotiate resolution of the issue. If informal negotiations fail to resolve the conflict, the matter will be elevated within EPA to the Administrator.

VIII. WEST VIRGINIA NONPOINT SOURCE PROGRAM PUBLIC INVOLVEMENT PLAN

Purpose

The public involvement goal of the Nonpoint Source Management Plan is to actively seek public involvement through participation, coordination and education to promote understanding of non-point source pollution issues and improvement approaches.

A. Public Forum and Workshop.

The West Virginia Nonpoint Source Resource Management Training Center will serve as one mechanism to provide information to the public. The Training Center's role

in the nonpoint program is to provide education, information and technology transfer from those who have the information to those who need it. The Resource Management Training Center will coordinate several regional public forums/workshops for the general public to inform individuals on the status of the nonpoint source program and to obtain suggestions and input for the future.

B. Watershed Assessment Program.

The Office of Water Resources, Watershed Assessment Program will conduct public meetings in each of the watersheds to be assessed during the five year period. Public meetings will provide the opportunity for the public in the local communities to meet with agency personnel and share information about water quality in the local area. This information will be incorporated into the background data the Nonpoint Source Coordinating Review Board will utilize in devising management plans.

C. Stream Partners Program and the West Virginia Watershed Network.

The Stream Partners Program is a collaboration of the member organizations of the Nonpoint Source Coordinating Review Board. The Stream Partners Program is working to provide technical assistance and financial support to watershed associations improving water quality in West Virginia. Technical assistance and financial support allow organizations to establish goals and priorities for cleanup in their watershed.

The West Virginia Watershed Network is a cooperative effort of organizations both governmental and non-governmental working with watershed associations in West Virginia. The Network meets four times each year to share resources, establish goals and priorities for improving water quality, and provide training to the public on watershed management.

D. Open meetings of the Nonpoint Source, Coordinating Review Board.

The NPS Coordinating Review Board will meet every six months to discuss nonpoint source management efforts and priorities in West Virginia. Meetings of the CRB will be open to the public and notice will be provided in the West Virginia State Register. Non-governmental organizations and citizens will be able to request time at the end of the meeting agenda to discuss nonpoint source water quality management issues in West Virginia.

E. West Virginia Watershed Management Framework

The Watershed Management Framework Committee evaluates data from all sources, public input and agency concerns to prioritize watersheds for the development of Watershed Restoration Action Strategies. Public scoping and screening meetings during Phase I of the Watershed Management Framework Cycle incorporates the public into this process. The process begins with an initial public outreach, going into the watershed and holding public meetings to determine where and what issues and concerns the meeting

participants have within the watershed. This information is used to learn where there may be public interest and support, as well as, what streams the Watershed Assessment Program (WAP) should assess during their watershed monitoring. During Phase III, watershed strategy development, public interest and potential participation is also a factor weighed into prioritizing watersheds. Watershed assessment reports and draft watershed strategic plans are presented and offered for public review and comment.

Nonpoint Source Program Management Plan Goals and Objectives

WMF - Watershed Management Framework
DEP – Division of Environmental Protection
DOF - Division of Forestry
OWR - Office of Water Resources
HHR - Health & Human Services
OAML&R - Office of Abandoned Mine Lands & Reclamation
SCA - Soil Conservation Agency
OM&R – Office of Mining & Reclamation
OO&G - Office of Oil & Gas
WVDA – WV Dept of Agriculture
USDA – US Dept of Agriculture
DNR – WV Division of Natural Resources
NRCS – Natural Resource Conservation Service
CRB – Coordinating Review Board
USFWS – US Fish & Wildlife Service

Category: Watershed Management		
Goal 2 – 1: Conduct restoration activities and best management practices implementation in the priority watersheds by 2020 as designated by the Watershed Management Framework and the TMDL process with the goal of achieving compliance with the Clean Water Act and fulfillment of all designated uses for all the state's watersheds.		
Objective	*Agencies*	*Year*
1. The Nonpoint Source Program will continue to coordinate with all partner agencies and stakeholders on all nonpoint source projects on an annual basis.	All categories	annual
2. Develop 2 to 5 Watershed Management Plans per year based on the WRAS's for the priority watersheds as designated by the Watershed Management Framework and TMDL processes.	WMF	2005
3. Have completed management plans for all 32 of the state's watersheds	WMF	2015
Goal 2 - 2: Annually update each existing category (agriculture, construction, silviculture, and resource extraction) and includes additional sub-category updates on sludge land application, basin wide management, hydrologic modification, urban stormwater and septic tank retrofit to allow use of SRF monies		
Objective	*Agencies*	*Year*
1. Category plans will be linked to clear watershed priorities as set by the Watershed Management Framework and the TMDL process.	OWR	2001.
2. List broad goals, objectives, and milestones with general expectations on when to complete the milestones	OWR	annual

Objective (Goal 2 – 2 continued)	*Agencies*	*Year*
3. Each category update will describe link to statewide watershed process and development of holistic watershed management plans; it will also describe how programs will deal with the changing priorities coming out of the Watershed Approach	All categories	annual
Goal 2 - 3: To assess the impact of nonpoint source pollution on the surface and groundwaters of West Virginia and to identify the specific causes of nonpoint source pollution by 2010.		
Objective	*Agencies*	*Year*
1. Highlight the successes since original Management Plan (e.g. Logging and Sediment Control Act, Construction Stormwater NPDES Permit, Poultry Initiative, AMD Initiatives).	OWR	2005
2. Complete the assessment phase of the Watershed Management Framework and provide the interpretation necessary for the designation of priority watersheds and the development of Watershed Restoration Action Strategies.	OWR	2003
3. To evaluate the effectiveness of the implementation of nonpoint source restoration and best management practices projects.	OWR	2010
4. Support the Office of Water Resources' Citizen Volunteer Monitoring Program to train, equip and coordinate with the volunteer stream monitors.	OWR	annually
Goal 2 - 4: Implement a pilot project to serve as a template for the establishment and refinement of a state wide program to replace or repair failing septic systems by 2015.		
Objective	*Agencies*	*Year*
1. Provide low interest state revolving fund loans to resident homeowners requiring financial assistance for the improvement, repair, or replacement of individual on-site wastewater disposal facilities where public health or water quality problems exist and where it is not physically feasible to connect to a public wastewater treatment system.	OWR, HHR	2002
2. Assess the success of the pilot project and make adjustments as necessary for a statewide program.	OWR, HHR	2003
Goal 2 – 5: Enforce the 404 permit through the 401 certification with compliance and technical assistance from the WV Soil Conservation Agency, WV Division of Natural Resources and the US Fish & Wildlife Service to achieve at least 90% compliance by 2005.		

Objective (Goal 2 – 5)	*Agencies*	*Year*
1. Objective 1: Provide technical assistance with in-stream management plans for approximately 200 landowners annually.	OWR, SCA, DNR, USFWS	2001 - 2003
Goal 2 – 6: Identify streams in the priority watersheds, as designated by the Watershed Management Framework process, where stream bank erosion is causing water quality problems.		
Objective	*Agencies*	*Year*
1. Incorporate stream bank stabilization needs as a part of watershed management plans for priority watersheds.	OWR	2001
2. Inventory stream bank stabilization needs in all priority watersheds.	OWR	2010
Goal 2 – 7: Provide assistance through the Landowner Stream Access Program to stabilize stream banks in the priority watersheds.		
Objective	*Agencies*	*Year*
1. Seek 319 funding to assist landowner stream bank stabilization projects in cooperation with SCD's in the priority watersheds.	OWR, SCA	2001
Goal 2 – 8: Assess the impact of urban runoff in the state's watersheds by 2005.		
Objective	*Agencies*	*Year*
1. Evaluate the data from the Watershed Assessment Program's monitoring to identify urban runoff problems.	OWR	2005
2. Identify those priority watersheds as designated in the Watershed Management Framework process with urban runoff problems.	OWR	2005
Goal 2 – 9: Develop an urban runoff program by 2005.		
Objective	*Agencies*	*Year*
1. Seek additional funding for the development of an urban runoff program.	OWR	2002
2. Develop an educational effort to educate developers and civic officials to the need, design and implementation of urban BMP's.	OWR	2005

Category: Agriculture		
Goal 3 – 1: Provide support to and coordination with WV Watershed Management Framework to identify, prioritize, and implement watershed projects – 2000 – 2005.		
Objective	*Agencies*	*Year*
1. Participate in interagency steering committee to determine priority watersheds.	WMF	annually
2. Work through SCDs to collect and summarize data regarding agriculture activities	SCA, OWR	annually
3. Work with and through the SCDs and local watershed groups to develop and implement Watershed Restoration Action Strategies (WRAS)	all categories	annually
4. Develop agriculture water quality management objectives and options for watershed management plans	all categories	annually
5. Determine and document the most effective best management practices and/or management options	all categories, CRB	annually
6. Provide BMP technical assistance to agriculture producers in identified priority watersheds	SCA	annually
7. Monitor progress of the agricultural portion of the watershed management plans	SCA	annually
Goal 3 – 2: Provide support and guidance to local watershed associations with agricultural nonpoint source issues		
Objective	*Agencies*	*Year*
1. Conduct a continuous assessment to determine where assistance is necessary	SCA	annually
2. Assist in the development of local watershed plans	SCA	annually
3. Coordinate with USDA, DEP, DNR, the WV Watershed Network and others to provide resources to local watershed groups	SCA, DEP, DNR, USDA,	annually
4. Support WV Stream Partners Program	SCA, DEP, DNR, DOF	annually
Goal 3 – 3: Establish riparian buffers and improve BMP technology to reduce impacts to surface waters from soil erosion on agricultural lands with a focus on priority watersheds identified through the Watershed Management Framework.		
Objective	*Agencies*	*Year*
1. Review and provide technical assistance for sediment control plan development for agricultural land disturbances	SCA	annually

Objective (Goal 3 – 3 continued)	*Agencies*	*Year*
2. Implement the approved Conservation Reserve Enhancement Program to establish 3500 miles of riparian areas or buffers to save soil and to reduce nitrogen and phosphorus loading by an estimated 63% and 70% respectively	SCA	2010
3. Study and expand the use of bioengineering techniques to stabilize stream banks.	SCA,DNR, OWR	2003
4. Develop 100 stream management plans for landowners in accordance with the WV Stream Access Permit for Landowners Program.	SCA	2005
Goal 3 – 4: Develop and implement nutrient management plans with agriculture producers to manage 580,000 lbs of nitrogen and 420,000 lbs of phosphorus per year.		
Objective	*Agencies*	*Year*
1. Write or update 120 nutrient management plans in cooperation with USDA, WSCA and CES.	SCA	annually
2. Provide technical assistance and follow up to farmers to ensure proper implementation of nutrient management plans such as appropriate timing and application rates of animal wastes, biosolids and chemical fertilizers	SCA	annually
3. Work with poultry integrators, growers and others to encourage marketing and distribution of 12,000 tons of poultry litter per year outside the Potomac Valley.	SCA	2005
Goal 3 – 5: Reduce reliance on government for implementation of the presidress nitrogen testing program (PSNT) to free up professional staff time to allow for broader education and technical assistance.		
Objective	*Agencies*	*Year*
1. Train farmers on importance of accurate soil sampling	SCA	2000
2. Train farmers on use of PSNT equipment	SCA	2000
3. Provide supplies through transition period	SCA	2001
4. Investigate other nutrient management technologies	SCA	2003
5. Transfer information on new technologies to farm community	SCA	2003
6. Investigate possibilities for use of volunteers or privatization of fee for service program through CES or farm cooperatives.	SCA	annually
Goal 3 – 6: Work with the agriculture community on the installation of agriculture best management practices with a focus on priority watersheds identified through Watershed Management Framework, TMDLs, etc.		

Objective (Goal 3 – 6)	*Agencies*	*Year*
1. Stabilize and/or relocate 500 livestock feeding areas to reduce / manage 201,667 lbs of nitrogen and 145,833 lbs of phosphorus annually	SCA	2003.
2. Identify and implement agriculture BMPs as needed	SCA	annually
3. Work with DEP referral program for assistance to violators through system identified in the WV Agriculture Position Paper.	SCA, DEP	annually
4. Work with farmers to encourage and provide technical assistance on composting of 16,000 tons of animal wastes	SCA	2005
5. Utilize litter composting demonstration project in Potomac Valley to continue educational efforts	SCA	annually
6. Develop and implement litter composting demonstrations in Eastern Panhandle and Greenbrier Valley Soil Conservation Districts	SCA	2005
7. Develop and implement other composting demonstrations with beef and / or horse manure	SCA	2005
Goal 3 – 7: Obtain a better understanding of the movement or transport of phosphorus through the soil to establish appropriate best management practices by 2005.		
Objective	*Agencies*	*Year*
1. Calibrate phosphorus index	SCA	2003
2. Evaluate the success of the use of the phosphorus index and associated BMPs.	SCA	2005
Goal 3 – 8: Evaluate status of Animal Feeding Operations (AFOs) in West Virginia		
Objective	*Agencies*	*Year*
1. Develop nutrient management plans and provide technical assistance to 10,900 livestock operations / potential AFOs	SCA	2009
2. Work with DEP, WVDA, NRCS, WVSCA, and farmers with the potential for causing NPS impacts from animal feeding operations on establishment of BMPs	SCA, DEP, WVDA, NRCS	annually
3. Identify potential sources of funding for implementing AFO BMPs through SRF, EQIP, etc	SCA	annually
Goal 3 – 9: Coordinate with WVDA, WVSCA, USDA, CES, WV Department of Health and Human Resources and others to establish waste management guidelines for aquaculture.		

Objective (Goal 3 – 9)	*Agencies*	*Year*
1. Develop standards and specifications for waste management	SCA	2002
2. Publish and distribute educational and technical materials on aquaculture waste management	SCA, NRCS	2003
3. Develop nutrient management plans for land application of by-products	SCA	annually
Goal 3 – 10: Manage pesticides on 5000 acres to protect surface and ground water by 2005**.**		
Objective	*Agencies*	*Year*
1. Work with farmers and non-farmers to reduce unnecessary use of pesticides through ICM/IPM program	SCA	annually
2. Develop an educational program for non-certified applicators of pesticides on pesticide application best management practices	SCA	2001
3. Conduct 5 workshops for non-certified applicators with an emphasis on identified priority watersheds	SCA	2005
4. Coordinate with statewide pesticide disposal committee to dispose of outdated and unused pesticides	SCA, WVDA	annually
Goal 3 – 11: Implement pesticide container disposal program coordinated by WV Department of Agriculture.		
Objective	*Agencies*	*Year*
1. Hold 5 pesticide container collection days	SCA, WVDA	annually
2. Collect 10,000 pesticide containers	SCA, WVDA	annually
3. Encourage the use of bags for pesticide use	SCA, WVDA	annually
4. Work with WV Department of Agriculture and USDA to install pesticide mixing pads / containment facilities where needed	SCA, WVSA, USDA	2002
5. Educate farmers and homeowners on the proper storage of pesticides	SCA	annually
Goal 3 – 12: Develop professional and credible field staff		
Objective	*Agencies*	*Year*
1. Participate in Mid Atlantic Certified Crop Advisor Program	SCA	annually
2. Provide necessary training to increase understanding of NPS issues and agriculture best management practices	SCA	annually
3. Provide training and development in new technologies and strategies to address NPS pollution	SCA	annually

Objective (Goal 3 – 12 continued)	*Agencies*	*Year*
4. Institutionalize summer intern program for the purpose of education and potential future staff resources	SCA	annually
Goal 3 – 13: Manage 3,000,000 lbs of nitrogen, 6,000,000 lbs of phoshorus and save 200,000 tons of soil through the statewide grassland management program by 2005.		
Objective	*Agencies*	*Year*
1. Educate 50 farmers annually on the importance and means for grassland management to reduce erosion by conducting 2 Forage Livestock Schools, 14 Grassland Field Days and 10 Pasture Walks	SCA	annually
2. Develop 300 grassland plans per year to manage bacteria, nutrients and soil erosion through, WVSCA, and CES	SCA, NRCS	annually
3. Provide accelerated technical assistance to farms on grassland management with a focus on identified priority watersheds	SCA	annually
4. Conduct forage analysis on 75 farms and fecal sampling on 6 farms to increase vegetation and decrease soil erosion by showing the economic benefits of improved grazing management	SCA	2003
5. Publish and distribute information on forage sampling and fecal analysis	SCA	2003.
6. Maintain and utilize 14 demonstration farms	SCA	2005
7. Establish and maintain a record keeping system for grassland demonstration farms in order to evaluate parameters of success	SCA	2005
8. Distribute record keeping information to other grassland farmers in WV.	SCA	2005
9. Investigate and promote pasture conversion / agroforestry on lands not suitable for grazing	SCA	annually
10. Work with USDA, CES and others to develop case studies on grassland demonstration farms	SCA, USDA	annually
11. Continue work with multi-agency and private sector, Grazing Lands Steering Committee	SCA	annually
12. Cooperate in development of Best Management Practices fact sheets including watering systems, forage analysis, grasslands management, and fencing	SCA	2002
Goal 3 – 14: - Conduct 55 (1 per county) presentations of WV Watersafe Program by 2005**.**		

Goal 3 – 15: Use the Agriculture Water Quality Loan Program (AgWQLP) in priority watersheds (including TMDL watersheds) in West Virginia to encourage implementation of needed best management practices – 2000 - 2005		
Objective	*Agencies*	*Year*
1. Coordinate loan program with USDA Environmental Quality Incentive Program, 319 Incremental Watershed projects, and other cost share programs	SCA, OWR	annually
2. Monitor the program yearly to incorporate needs, practices, etc. to improve and protect water quality	SCA	annually
3. Investigate the use of the Safe Drinking Water Act Revolving Loan Fund to implement agriculture water quality best management practices in source and wellhead protection areas	SCA	2004
Goal 3 – 16: Plan for nutrient and animal waste to reduce NPS impacts to surface and ground water by managing 65,000 lbs of nitrogen, 45,000 lbs of phosphorus and reduce soil erosion by 6500 tons, with a focus on priority watersheds identified through the Watershed Management Framework by 2005.		
Objective	*Agencies*	*Year*
1. Work with agriculture operations over a five year schedule as outlined by the WV watershed groupings established by the WV Watershed Management Framework to ensure appropriate and environmentally sound land application of biosolids	SCA, OWR	annually
2. Train field staff in status of regulatory program and WVSCA, CES and DEP responsibilities for the biosolids program	SCA, OWR	2000
3. Coordinate development of 50 nutrient management plans annually with regulatory requirements for trace elements, pathogens, etc. on agriculture operations land applying biosolids	SCA, OWR	annually
4. Conduct 50 land application site evaluations for site approval prior to land application	SCA	2005
5. Train farmers on biosolids program and related best management practices	SCA	annually
6. Conduct Nutrient Management Plan follow up on 100 plans	SCA	2005
7. Work with farmers on correct spreader calibration	SCA	annually
8. Provide assistance to WTPs to conduct soil testing with metal analysis	SCA	annually
9. Research the long-range effects of biosolids application	SCA	2005
10. Research background metals in several WV soil types	SCA	2001
11. Implement use of GIS/GPS to track land application sites	SCA	annually

Goal 3 – 17: Improve and protect surface and groundwater in the South Branch, Potomac by managing 134,000 tons of animal waste consisting of 11,691,200 lbs of nitrogen and 8,170,400 tons of phosphorus by 2005.		
Objective	*Agencies*	*Year*
1. Maintain Potomac Interagency Water Quality Office	SCA	annually
2. Maintain litter composting demonstration and identification of alternative uses and to remove 12,000 tons of litter from the watershed	SCA	annually
3. Develop and monitor 400 nutrient management plans on 40,400 acres to manage 114,800 tons of poultry litter and 19,200 tons of beef manure	SCA	2005
4. Install 250 litter storage sheds to manage 114,800 tons of litter consisting of 11,480,000 lbs of nitrogen and 8,036,000 lbs of phosphorus	SCA	2003
5. Install 250 dead bird composters	SCA	2003
6. Improve 100 livestock feeding areas to manage 211,200 lbs of nitrogen and 134,400 lbs of phosphorus	SCA	2003
7. Establish 50 miles of riparian or buffer areas to save 5,400,000 tons of soil and reduce nitrogen and phosphorus by 63 % and 70% respectively	SCA	2005
8. Manage 1-800 litter hotline to facilitate the movement of 12,000 tons of litter between sellers with excess amounts and buyers outside the watershed	SCA	annually
9. Participate in WV Poultry Festival through displays, presentations, etc. Enforce the WVDA Dead Bird Disposal Regulations, Title 61CSR1C for the poultry industry	SCA	annually
10. Assess and evaluate the watershed to establish work elements and effectiveness of program	SCA	annually
Goal 3 – 18: Coordinate efforts between agencies through WVDA Laboratory facilities		
Objective	*Agencies*	*Year*
1. Monitor water quality in cooperation with WVSCA, WVDA, WV DEP and other public and private groups to establish success of BMP installation and water quality conditions	SCA, DEP, WVDA	annually
2. Conduct manure and litter analysis for nutrient management plan development and implementation	SCA	annually
Gaol 3 – 19: Utilize USDA Environmental Quality Incentive Program and other available programs to provide financial assistance to implement water quality best management practices in watersheds targeted through the WV Watershed Management Framework		

Objective (Goal 3 – 19)	*Agencies*	*Year*
1. Participate in local work groups and state technical committee to ensure inclusion of NPS program goals	SCA, USDA	annually
2. Assist in identifying needed best management practices in priority watersheds	SCA, USDA	annually
3. Promote use of USDA funding by farmers in state priority watersheds	SCA, USDA	annually
Goal 3 – 20: Work to address issues related to the urban/rural interface in the growing Eastern Panhandle and other areas of the state		
Objective	*Agencies*	*Year*
1. Educate urban homeowners, and non-farm landowners on how their activities (application of chemical fertilizers and pesticides, etc.) affect water quality by holding 5 workshops on urban/rural issues	SCA	2005
2. Investigate and make available farmland protection/preservation opportunities for agriculture producers	SCA	annually
Goal 3 – 21: Improve data management and tracking of BMPs to show and measure water quality improvements		
Objective	*Agencies*	*Year*
1. Work with WVSCA GIS program to establish database of BMPs, costs, and water quality improvements.	SCA	2001
2. Develop and maintain database of biosolids information	SCA	2002
Goal 3 – 22: Conduct conservation and water quality education presentations and programs – 2000 - 2005.		
Objective	*Agencies*	*Year*
1. Work with Watershed Resource Center and other public and private groups to develop agriculture educational materials and programs	SCA	annually
2. Conduct 5 agriculture workshops	SCA	annually
3. Conduct 14 agriculture field days	SCA	annually
4. Provide information and articles to NPS Newsletter, Today's Resources	SCA	annually
5. Conduct education for schools, universities, public groups on agriculture and NPS pollution	SCA	annually
6. Educate landowners on the potential problems associated with underground fuel storage and encourage the use of and conversion to aboveground facilities	SCA	2002 - 2005

Goal 3 – 23: Increase public involvement in agriculture NPS program		
Objective	*Agencies*	*Year*
1. Deliver the NPS program through the WV Soil Conservation Districts	SCA	annually
2. Cooperate with WV Watershed Management Framework, Soil Conservation Districts, Watershed Associations to include the public in the identification of problems, prioritization of watersheds and the development and implementation of watershed strategies	SCA	annually
3. Conduct general public outreach activities to educate the public on NPS issues and WV's approach to NPS management for agriculture	SCA	annually
4. Publish and distribute newsletters, news articles, etc. to keep the public involved and aware	SCA	annually
5. Through the Agriculture Technical Subcommittee evaluate and make recommendations for the NPS program for agriculture	SCA	2004.

Category: Construction		
Goal 4 – 1: Provide support to and coordination with WV Watershed Management Framework to identify, prioritize, and implement watershed projects		
Objective	*Agencies*	*Year*
1. Participate in interagency steering committee to determine priority watersheds.	SCA	annually
2. Assist in collecting and summarizing data regarding construction activities	SCA, OWR	annually
3. Assist in the development of construction water quality management objectives and options for watershed restoration action strategies	SCA	annually
4. Determine and document the most effective best management practices and/or management options	SCA	annually
5. Provide BMP technical assistance to contractors and developers in identified priority watersheds	SCA	annually
6. Assist in monitoring the progress of the construction portion of the watershed action plans	SCA	annually
Goal 4 – 2: Provide support and guidance to local watershed associations with construction nonpoint source issues		
Objective	*Agencies*	*Year*
1. Conduct a continuous assessment to determine where assistance is necessary	SCA	annually

Objective (Goal 4 – 2 continued)	*Agencies*	*Year*
2. Assist in the development of local watershed plans	SCA	annually
3. Coordinate with USDA, DEP, DNR, the WV Watershed Network and others to provide resources to local watershed groups	SCA, USDA, DEP, DNR	annually
4. Support the WV Stream Partners Program	SCA, DEP, DNR, DOF	annually
Goal 4 – 3: Reduce erosion of 108,000 tons of soil on 1200 acres of construction sites and other disturbed areas by 2002.		
Objective	*Agencies*	*Year*
1. Review approximately 150 Construction Sediment Control Plans	SCA	annually
2. Offer technical assistance on all construction and disturbed areas.	SCA	2000 - 2002
Goal 4 – 4: Obtain consistent implementation and maintenance of construction BMPs by contractors by providing routine, on-site technical assistance to contractors and developers in cooperation with WVDEP - 2000 - 2005.		
Goal 4 – 5: Educate contractors, developers, engineers and other professionals on construction nonpoint source issues and best management practices		
Objective	*Agencies*	*Year*
1. Finalize construction BMP manual for WV contractors and developers.	SCA	2001
2. Hold watershed based construction BMP workshops for contractors, etc. through the Watershed Resource Center	SCA	annually
3. Participate in WV Contractors EXPO through displays and presentations	SCA	annually
4. Make nominations and award state winner of Conservation Contractor and Developer of the Year Contest	SCA	annually
Goal 4 – 6: Educate the general public including schools on construction nonpoint source issues and best management practices using the Enviroscape® and the Watershed Resource Center		
Objective	*Agencies*	*Year*
1. Make presentations to civic groups, schools and at other public places on the effects and benefits of construction and stormwater management	SCA	annually
2. Encourage the use of the public media by Soil Conservation Districts to increase understanding of sediment and erosion control	SCA	annually

Goal 4 – 7: Improve the understanding of local governments on the need for regulations and adequate construction and stormwater management programs in identified priority watersheds		
Objective	*Agencies*	*Year*
1. Focus on educating the residents, contractors, engineers, local planning commissions, and governments to incorporate stormwater management, sediment and erosion control considerations and BMPs into current regulatory program	SCA	annually
2. Make presentations to local planning commissions and governments on the benefits of construction and stormwater management programs	SCA	annually
Goal 4 – 8: Improve stormwater management in West Virginia		
Objective	*Agencies*	*Year*
1. Strengthen NPDES permitting requirements to include post construction / permanent best management practices for stormwater management.	SCA, OWR	2002
2. Integrate urban runoff best management practices to prevent pollution due to the increase of impermeable surfaces that accompanies development	SCA, OWR	annually
3. In cooperation with local government, review storm water control design simultaneously with erosion control plan review	SCA, OWR	annually
4. Provide technical and financial assistance to local governments, communities, and watershed groups on stormwater management	SCA, OWR	annually
Goal 4 – 9: Provide information to contractors, developers and landowners on the potential for groundwater impacts from construction activities and ways these might be reduced		
Objective	*Agencies*	*Year*
1. Assist in the development of Groundwater Protection Plans (GPPs) for construction activities to reduce the potential for pollution of groundwater during construction.	SCA	annually
2. Incorporate information on groundwater impacts from construction and associated best management practices into workshops provided through the Watershed Resource Center.	SCA	annually

Goal 4 – 10: Increase public involvement in construction NPS program		
Objective	*Agencies*	*Year*
1. Deliver the NPS program through the WV Soil Conservation Districts	SCA	annually
2. Cooperate with WV Watershed Management Framework, SCDs, and watershed groups to include the public in the identification of problems, prioritization of watersheds and the development and implementation of watershed restoration action strategies	SCA	annually
3. Coordinate general public outreach activities to educate the public on NPS issues and WV's approach to NPS management for construction	SCA	annually

Category: West Virginia Watershed Resource Center		
Goal 5 – 1: Provide support, education and information to WV's watershed based management efforts		
Objective	*Agencies*	*Year*
1. Maintain library of information to provide information relevant to watersheds	SCA	annually
2. Maintain the website with interactive information useful to watershed groups, agencies and others	SCA	annually
3. Include watershed associations in relevant mailings of information such as workshops, newsletter, etc	SCA	annually
4. Assist with public outreach and information transfer for WV Watershed Network	SCA	annually
5. Assist with public outreach and information transfer for WV Watershed Management Framework	SCA	annually
6. Coordinate the development of 2 watershed atlases based on the 8-digit hydrologic unit code for inclusion on the interactive web page	SCA	annually
Goal 5 – 2:: Provide training and information transfer for watershed associations, agencies, and the general public on nonpoint source pollution, watershed management, and NPS best management practices		
Objective	*Agencies*	*Year*
1. Provide support to the WV Watershed Network in conducting 2 training activities for watershed associations	SCA	annually
2. Coordinate with NPS Environmental Specialists to provide 4-targeted NPS technical workshops to watershed associations	SCA	annually

Objective (Goal 5 – 2 continued)	*Agencies*	*Year*
3. Coordinate workshops identified in the WV Watershed Management Framework watershed restoration action strategies	SCA	annually
Goal 5 – 3: Assist in the outreach and recognition for watershed activities		
Objective	*Agencies*	*Year*
1. Develop a display to promote and support the watershed activities of the WRC and the State	SCA	2001
2. Publish *Watershed Resources* newsletter to include articles related to watershed efforts	SCA	annually
3. Provide support to the WV Watershed Network for Water Celebration Day	SCA	annually
4. Develop and coordinate a WV Soil and Water Conservation Partnership Watershed Conservation Awards program	SCA	2005
Goal 5 – 4: Promote an understanding of nonpoint source issues, conservation education, watershed management, and NPS best management practices		
Objective	*Agencies*	*Year*
1. Exhibit at activities, conferences and field days	SCA	annually
2. Transfer information received by the WRC to watershed associations, agencies, the general public and industry through mailings, *Watershed Resources* newsletter, and library requests	SCA	annually
3. Develop website of information re: training activities, library materials, and other information	SCA	2001
4. Maintain Website of information re: training activities, library materials available and other information	SCA	annually
5. Manage and distribute *Watershed Resources* Newsletter	SCA	annually
6. Coordinate training and exhibit for the WV Equipment and Technology Design Exposition (Contractor's EXPO)	SCA	annually
7. Coordinate Contractor and Developer of the Year Awards Program through, WVSCA, WV DEP, USDA NRCS and WV's 14 Soil Conservation Districts.	SCA	2000 – 2003
8. Provide support to WV Envirothon	SCA	annually
9. Host National Envirothon.	SCA	2004

Objective (Goal 5 – 4 continued)	*Agencies*	*Year*
10. Provide conservation education and information to educators, youth and the general public through the WV Conservation Education Council, WV Conservation Camp, Enviroscape presentations, and SAMARA program	SCA	annually
11. Provide support to the WV Soil and Water Conservation Partnership Annual Conference	SCA	annually

Category: Silviculture		
Goal 6 – 1: Administer the Logging Sediment Control Act which will reduce the impacts or potential impacts to water quality.		
Objective	*Agencies*	*Year*
1. Provide training to 1,500 loggers per year, which satisfies the certification process	DOF	annually
2. Monitor compliance with the Logging Sediment Control Act and effectiveness of required best management practices. Improve compliance levels by 5 percent	DOF	2005
3. Convene a best management practice review committee at three year intervals.	DOF	2003
Goal 6 – 2: Educate industry and consulting foresters along with private non-industrial landowners on the use and advantages of best management practices.		
Objective	*Agencies*	*Year*
1. Hold 2 special silvicultural training sessions per year	DOF	annually
2. Provide literature to private non-industrial landowners. This will be accomplished through fairs, festivals and presentations to 40,000 people per year	DOF	annually
Goal 6 – 3: Reduce the occurrence and size of fires and protect the forest land from insect and disease problems by developing a strong prevention program in each county		
Objective	*Agencies*	*Year*
1. Increase fire prevention announcements in newspapers, radio and television to 2 per county per year.	DOF	annually
2. Provide 425 programs to schools, clubs and associations reaching approximately 35,000 kids per year	DOF	annually
3. Attend 110 fairs, festivals or other activities and distribute literature on the fire program to approximately 37,000 people per year	DOF	annually

Objective (Goal 6 – 3 continued)	*Agencies*	*Year*
4. Prepare fire plans for woodland home subdivisions as needed	DOF	annually
Goal 6 – 4: Enhance detection capability and increase suppression activity.		
Objective	*Agencies*	*Year*
1. Use additional seasonal patrolmen for detection and rapid crew deployment, located in trouble areas.	DOF	annually
2. Use of satellite imagery	DOF	annually
3. Use of aerial tanker(s).	DOF	annually
4. Hold 100 training sessions to Train 2,300 fire fighters, wardens and VFDs in suppression skills	DOF	annually
Goal 6 – 5: Monitor and protect forest health		
Objective	*Agencies*	*Year*
1. Monitor 40 plots per year while participating in the National Forest Health Monitoring Program.	DOF	annually
2. Implement management activities to reduce or eliminate impacts of insect and disease annually.	DOF	annually
3. Continue cooperation with the Dept of Agriculture on gypsy moth suppression annually.	DOF	annually
Goal 6 – 6: Encourage forest management on all forest land which will ensure a productive forest and enhance water quality		
Objective	*Agencies*	*Year*
1. Assist 4,000 private non-industrial landowners in forest management	DOF	annually
2. Write 20 management plans	DOF	annually
3. Provide 80programs per year on forest management to clubs, associations and other various groups	DOF	annually
Goal 6 –7: Conduct multiple-use management on public lands.		
Objective	*Agencies*	*Year*
1. Demonstrate multiple-use principles through timber harvests	DOF	annually
2. Provide areas for recreational users such as hikers, bikers, fisherman and hunters	DOF	annually
3. Conduct 8 tours per year on state forests that demonstrate multiple-use principles	DOF	annually
4. Develop and implement 200 management plans with consulting foresters	DOF	annually

Goal 6 – 8: Promote and service the West Virginia Tree Farm Program, which requires a management plan for involvement.		
Objective	*Agencies*	*Year*
1. Conduct 130 inspections per year	DOF	annually
2. Assist with article writing in the Tree Farm newsletter	DOF	annually
3. Inform private non-industrial landowners about the program and its benefits	DOF	annually
Goal 6 – 9: Increase communities involved with the Urban Forestry Program.		
Objective	*Agencies*	*Year*
1. Provide assistance to those cities interested in the Tree City USA program (5 per year).	DOF	annually
2. Conduct 4 tours of Tree Cities per year to show benefits and results.	DOF	annually
3. Promote urban beautification and tree health with 20 grants per year for projects that address beautification and tree health.	DOF	annually
4. Provide technical assistance to 50 cities and 200 homeowners per year on tree care and maintenance to increase health.	DOF	annually
Goal 6 – 10: Support the Stewardship Incentive Program (SIP) and Forest Incentive Program (FIP) and promote increased landowner involvement		
Objective	*Agencies*	*Year*
1. Inform 300 private non-industrial landowners per year of various programs that will assist in managing their resource	DOF	annually
2. Assist with implementing programs by providing technical support on various planned activities	DOF	annually
Goal 6 – 11: Cooperatively manage watersheds as a whole with other players and achieve common goals with sound forestry management practices.		
Objective	*Agencies*	*Year*
1. Promote the Forest Stewardship Program so as to increase the number of planned acres in the Upper Elk Watershed.	DOF	2002
2. Promote the Forest Stewardship Program within WV's priority watersheds. This will be achieved through workshops, WV's Stream Partners Program, Watershed Framework and the Forest Steward Publication	DOF	annually
3. Train and educate 1,500 loggers and 300 private non-industrial landowners per year regarding proper timber harvesting techniques	DOF	annually

Objective (Goal 6-11 continued)	*Agencies*	*Year*
4. Promote sound environmentally sensitive management of riparian buffer zones through distribution of WV's silvicultural best management practices book, 2000 per year.	DOF	annually
5. Participate to identify, prioritize and implement watershed projects as part of the watershed management framework	DOF	annually

Category: Resource Extraction		
Goal 7 – 1: By 2025, support and attain designated and beneficial water uses in watersheds affected by acid mine drainage from abandoned mine lands.		
Objective	*Agencies*	*Year*
1. Prioritize projects for resource extraction category NPS pollution protection and restoration using the Section 303 (d) List of Impaired Waters, Anti-Degradation Policy, Watershed Management Framework, and Resource Extraction Category Mandates, Policies, and Programs for using a Holistic Watershed Approach.	OAML&R	annually
2. Participate in restoration plan development and implementation of Total Maximum Daily Loads (TMDLs) for waterbodies impacted by resource extraction category NPS pollution contained in the Section 303 (d) List of Impaired Waters	OAML&R	annually
3. Full implementation of AMD treatment projects in the Paint Creek Watershed to restore 59.48 impaired stream miles to full designated uses.	OAML&R	2005
4. Full implementation of the Sovern Run and Green's Run AMD treatment projects in the Lower Cheat Watershed to restore 12.9 impaired stream miles to full designated uses.	OWR, OAML&R	2005
5. Dependent upon completion of TMDLs and sufficient funding, the implementation of AMD treatment projects in the Stoney River Watershed to restore 5.26 impaired stream miles.	OWR, DNR, OAML&R	2012
6. Dependent upon completion of TMDLs and sufficient funding, the implementation of AMD treatment projects in the Tug Fork River Watershed to restore 174.69 impaired stream miles.	OWR, DNR, OAML&R	2012

Objective (Goal 7-1 continued)	*Agencies*	*Year*
7. Dependent upon completion of TMDLs and sufficient funding, the implementation of AMD treatment projects in the Monongahela River Watershed to restore 152.72 impaired stream miles.	OWR, DNR, OAML&R	2012
8. Dependent upon completion of TMDLs and sufficient funding, the implementation of AMD treatment projects in remaining Group A watersheds impacted by AMD according to the TMDL schedule (page 54) and the Watershed Management Framework (page 38 – 50)	OWR, OAML&R	2015
9. Dependent upon completion of TMDLs and sufficient funding, the implementation of AMD treatment projects in remaining Group B watersheds impacted by AMD according to the TMDL schedule (page 54) and the Watershed Management Framework (page 38 – 50)	OWR, OAML&R	2016
10. Dependent upon completion of TMDLs and sufficient funding, the implementation of AMD treatment projects in remaining Group C watersheds impacted by AMD according to the TMDL schedule (page 54) and the Watershed Management Framework (page 38 – 50)	OWR, OAML&R	2017
11. Dependent upon completion of TMDLs and sufficient funding, the implementation of AMD treatment projects in remaining Group D watersheds impacted by AMD according to the TMDL schedule (page 54) and the Watershed Management Framework (page 38 – 50)	OWR, OAML&R	2018
12. Dependent upon completion of TMDLs and sufficient funding, the implementation of AMD treatment projects in remaining Group E watersheds impacted by AMD according to the TMDL schedule (page 54) and the Watershed Management Framework (page 38 – 50)	OWR, OAML&R	2019
13. Monitor and maintain AMD treatment to protect water quality in the AMD impaired streams	OWR, OAML&R	2025
Goal 7 – 2: By 2010, provide information and data necessary utilizing a Holistic Watershed Approach to assist in developing watershed management plans through the Watershed Management Framework for the protection and restoration of water resources impacted by resource extraction category NPS pollution		
Objective	*Agencies*	*Year*
1. Establish policies and procedures and create incentives to encourage business, industry, and public involvement.	OAML&R	2010
2. Encourage effective communication and coordination among local, state, and federal government agencies	OAML&R	annually
3. Participate in integrated sampling for watershed characterizations in two watersheds	OAML&R	2006

Objective (Goal 7-2 continued)	*Agencies*	*Year*
4. Provide all data to the TAGIS Support Group to create and develop accurate GIS maps of resource extraction category pollution for decision-making, modeling, prioritizing, TMDLs, and measuring the environmental benefits of protection and restoration projects	OAML&R	annually
5. Standardize and integrate all environmental data collection, BMPs, and treatment and abatement alternatives for resource extraction category NPS pollution	OAML&R	annually
Goal 7 – 3: Participate in watershed-based programs to support resource extraction category NPS pollution watershed protection and restoration activities		
Objective	*Agencies*	*Year*
1. Utilize Watershed Management Framework Steering Committee, NPS CRB, and Stream Restoration Group as liaisons between the NPS Program and watershed-based efforts	OAML&R	annually
2. Provide training, assistance, and guidance for public and stakeholder involvement in integrated sampling for watershed characterizations in two watersheds	OAML&R	2006
3. Incorporate the Nine Key Elements into the Resource Extraction Category NPS Management Program to achieve "Enhanced Benefits Status"	OAML&R	annually
Goal 7 – 4: By 2001, begin the implementation of watershed protection and restoration plans in priority watersheds that address resource extraction category NPS pollution utilizing a Holistic Watershed Approach through a Watershed Management Framework that identifies priorities, solutions, funding, implementation, and stakeholders		
Objective	*Agencies*	*Year*
1. Encourage and promote BMPs that ensure proper oil and gas waste disposal, land reclamation, erosion and sediment control, and plugging abandoned wells	OO&G	annually
2. Encourage and promote BMPs that ensure proper oil and gas waste disposal, land reclamation, erosion and sediment control, and plugging abandoned wells	OAML&R, OO&G	annually
3. Implement policies and procedures and offer incentives to encourage business, industry, and public involvement	OAML&R	annually
4. Offer incentives to advocate the remining of abandoned mine lands	OAML&R	annually

Goal 7 – 5: By 2001, begin the development and implementation of new and innovative BMPs, treatment and abatement alternatives, and prevention technologies for resources extraction category NPS pollution		
Objective	*Agencies*	*Year*
1. Advocate the use of best available technologies for determining and predicting post-mining polluted coal mine drainage on new mining permit applications	OM&R	annually
2. Promote the use of technologies for preventing underground mine discharges and breakouts	OAML&R, OM&R	annually
3. Assist oil and gas industry to develop most cost-effective and environmentally beneficial methods for wastewater disposal and erosion and sediment control	OO&G	annually
4. Encourage policies and procedures development and changes to account for the treatment, abatement, and prevention of the formation of polluted coal mine drainage associated with active mining	OM&R	annually
5. Establish and encourage technology and information transfer and dissemination; innovative technological advancements; new concepts of resource recovery; and diverse stakeholders to apply nontraditional technologies to protection and restoration	OAML&R	annually
Goal 7 – 6: By 2004, increase existing and secure additional funding for resource extraction category NPS pollution watershed protection and restoration projects, Holistic Watershed Approach, and Watershed Management Framework		
Objective	*Agencies*	*Year*
1. Encourage Congress to allocate the remainder of the Abandoned Mine Land Fund for the purposes it was collected.	OAML&R	2004
2. Encourage Congress to spend what is collected annually with the Abandoned Mine Land Fund as outlined in the Surface Mining Control and Reclamation Act of 1977.	OAML&R	2004
3. Secure funding resources for long-term integrated sampling for watershed characterizations	OAML&R	2004
4. Secure funding resources for the development and implementation of new and innovative BMP, treatment, abatement, and prevention technologies	OAML&R	2004
5. Leverage additional funding resources for plugging abandoned and orphaned oil and gas wells	OO&G	2004

Objective (Goal 7-6 continued)	*Agencies*	*Year*
6. Secure funding resources to begin to address high-volume abandoned mine and oil and gas well discharges	OAML&R, OO&G	2004
7. Develop and secure long-term operations and maintenance funding for polluted coal mine drainage treatment, abatement, and prevention protection and restoration projects	OAML&R	2004
8. Develop and secure long-term funding resources to continue to provide perpetual treatment and abatement of polluted coal mine drainage	OAML&R	2004
9. Encourage Congress to reauthorize the Surface Mining Control and Reclamation Act of 1977	OAML&R	2004
Goal 7 – 7: Participate in fostering five Watershed Associations per Watershed Management Framework cycle to implement a Holistic Watershed Approach and participate in the Watershed Management Framework to support watershed protection, restoration, and management activities relating to resource extraction category NPS pollution		
Objective	*Agencies*	*Year*
1. Foster five partnerships and develop stakeholders to support planning and implementation	OAML&R	2006
2. Work with five Watershed Associations interested in watershed protection and restoration as in relates to resource extraction category NPS pollution	OAML&R	2006
3. Offer two conferences, training, and/or workshops on assessments, funding, grant writing, Holistic Watershed Approach, monitoring, networking, and Watershed Management Framework	OAML&R	2006
4. Assist five Watershed Associations through the Stream Partners Program, Holistic Watershed Approach, and Watershed Management Framework in writing grants and leveraging their resources for watershed protection and restoration projects	OAML&R	2006
Goal 7 – 8: Participate in five public forums by 2006 to provide outreach and education and create resource extraction category NPS pollution awareness as a part of the Holistic Watershed Approach, Watershed Management Framework, Watershed Network, and Stream Partners Program		
1. Disseminate information on the extent, causes, and effects of resource extraction category NPS pollution and the benefits of protection and restoration	OAML&R	annually

Objectives (Goal 7-8)	*Agencies*	*Year*
2. Provide outreach, education, and information on protection and restoration, and roles and responsibilities to all stakeholders involved in treatment, abatement, and prevention of resource extraction category NPS pollution	OAML&R	annually
3. Provide Annual Status Reports to EPA and all stakeholders	OAML&R	annually

Chapter 2 – Watershed Management

I. OFFICE OF WATER RESOURCES' NONPOINT SOURCE PROGRAM

Through the Office of Water Resources Nonpoint Program, guidance is provided to insure that the components of the management program are complied with and that the goals and its objectives are achieved. Effective coordination involves oversight of the interagency agreements, directing and evaluating cooperating agencies in proper adherence to 319 Grant Guidance requirements, coordination and communication between the management agencies through regular meetings of the NPS Coordinating Review Board, water quality monitoring support for priority watershed projects, resolving nonpoint source pollution complaints, promotion of BMP planning, implementation of BMP's to control or prevent nonpoint pollution, establishing liaison with numerous Federal and State government agencies and providing enforcement support when needed.

The Office of Water Resources manages and coordinates the statewide nonpoint source program within the Division of Environmental Protection and through the various cooperating agencies.

Responsibilities include preparing, reviewing and approving nonpoint source pollution control plans; preparing guidelines, regulations and policies for implementing plans; delegating program activities to state and federal agencies through negotiations of interagency agreements; oversight of other agency progress in implementing related work; providing water quality monitoring; analysis and evaluation of water quality and the impact of nonpoint source pollution through field compliance investigations.

Administration and coordination involves a concentrated effort on the part of both the lead agency and cooperating management agencies staff. Due to the complexity that is created by nonpoint sources of pollution, specially trained personnel are necessary to address problems and to support management agency efforts.

Accomplishing the goals and objectives of the NPS Management Program requires the maintenance of public awareness through development of educational materials, public presentations, media and individual contacts.

While the 1989 Nonpoint Source Assessment provided information on the nonpoint impacts to the state's waters, it was primarily based on evaluated data. Very little actual water quality data was available. Recognizing that limited funding was available to generate, through monitoring, the water quality data needed to verify problems or improvements, more emphasis was placed on rapid biomonitoring to support demonstration projects. In addition land use data provided by the cooperating agencies has been used to help establish a more representative cause/effect relationship between sources and impacts. Under this updated management plan, monitoring of water quality will be done using the watershed approach. This will be accomplished through the Office

of Water Resources Watershed Assessment Program. This program is responsible for providing water quality data and monitoring support to the various programs and projects on going in West Virginia.

West Virginia's approach to nonpoint source pollution will incorporate pollution prevention as a guiding process for addressing pollution issues.

Pollution Prevention is a common sense approach to controlling pollutants. Pollution prevention begins with the idea that pollutants should be reduced at their source, rather than at the end of a water treatment process. P2 may include alternative production process, changes in operation, reduction or alteration of raw material used, and replacing toxic process materials with non-toxic materials. The components of pollution prevention may be outlined as follows: source reduction, recycling treatment and proper disposal. Environmental considerations and the economics of cleaner production are combined through a focus on pollution prevention, which is the methodology of reducing or eliminating wastes at their source. Source reduction and pollution prevention are now considered synonymous terms.

West Virginia's Pollution Prevention Program will assist the various nonpoint communities by providing pollution prevention alternatives, and compliance assistance when ever possible.

II. WV WATERSHED MANAGEMENT FRAMEWORK

West Virginia's Commitment to Protecting Water Resources

West Virginia is dedicated to protecting and enhancing the quality of its water resources for today's citizens and future generations. That mission—so vital to the quality of life in West Virginia—is soundly based in State laws and technical assistance programs that enable agencies to address contamination problems created in the past and to ensure sound environmental management in current activities. Importantly, the mission is also supported by multiple volunteer efforts to protect and restore the state's water quality—initiatives taken by local associations, local governments, business, farmers, and assisting agencies.

Agencies in West Virginia are empowered to protect the state's water resources by numerous state and federal laws and programs. For example, the objective of the federal Clean Water Act, enacted in 1972, is to restore and maintain the chemical**,** physical, and biological integrity of the Nation's waters and, where attainable, to achieve a level of water quality that provides for the protection and propagation of fish, shellfish, and wildlife; for recreation in and on the water; and for the protection of public health. The Clean Water Act contains many statutory provisions to control sources of pollution to help achieve this goal. In particular, the act authorizes states to establish regulatory programs to implement and enforce controls on point source discharges, stormwater runoff, and discharges of dredged or fill material. It also established state nonpoint source management programs aimed at reducing pollution from agriculture, mining, oil and gas

extraction, logging, and construction. The programs and policies of the Clean Water Act provide a large part of the foundation for protection of West Virginia's waters. Other examples of laws helping to protect water quality include the federal Safe Drinking Water Act, enacted in 1974, and the 1992 Logging Sediment Control Act.

DEP'S Decision to Implement a Watershed Management Approach

To demonstrate its commitment to restoring and protecting the state's water resources, West Virginia's Division of Environmental Protection (DEP) is working with partners to institute a new approach—called statewide watershed management—for managing West Virginia's waters and their surrounding ecosystems. What is watershed management? It is not a new regulatory program. It is a way to coordinate the operations of existing water quality programs and activities in West Virginia to better achieve shared water resource management goals and objectives. The term "watershed," in this context, is broadly defined as the geographic delineation of an entire water body system and the land that drains into it. Because of their readily identifiable boundaries, watersheds provide functional spatial units for coordinating management efforts. Watershed management involves using watersheds as a way to organize and focus partners' activities, based on the premise that water resource protection and restoration are best addressed through integrated efforts within defined hydrologic regions.

Watershed management is a resource-centered approach. Success is measured in terms of improving and maintaining environmental quality and protecting public health. Implementation fosters the protection and restoration of specific water uses such as aquatic life habitat and propagation, drinking water supply, recreation, and irrigation.

Sound water resource management decisions depend on understanding the relationship between water quality, water use, and conditions within the watershed. Essential to this understanding are accurate watershed assessments that characterize the physical, chemical, and biological conditions of water bodies; identify causes and sources of water resource contamination and degradation; and evaluate the effectiveness of alternative management actions. The culmination of watershed-based assessments is the implementation of regulatory and voluntary management actions that address local water resource problems. This integrated assessment and management reflects the interrelated nature of watersheds themselves, and fosters innovative, responsive, and cost-effective solutions to water quality problems.

Integrated management doesn't just happen. Since watershed management activities encompass numerous functions of DEP, as well as of many other public and private efforts, significant coordination is essential to sound decision making and management.

Partners in Designing and Implementing the Approach and Our Resolution of Mutual Intent

On May 29, 1996, at the invitation of DEP's Office of Water Resources (OWR), approximately 30 agency and program directors attended the Statewide Watershed Management Workshop. The group discussed the key natural resource, administrative, and public outreach challenges they will face in the future, as well as which of those challenges could be addressed though a cooperative watershed approach. Although the agencies had different water resource management responsibilities and perspectives, they shared common concerns and goals. In this and a follow-up workshop, agency managers formed the Interagency Watershed Management Workgroup to design a framework for coordinating watershed management activities. The Workgroup met monthly from August 1996 through February 1997 to design the Watershed Management Framework outlined in this document. It was the intent of the Workgroup to design a durable, flexible framework—one that can be strengthened based on lessons learned or expanded as new partners seek to participate. To signal their support for coordinating watershed management efforts, partner agencies have signed the following Resolution of Mutual Intent.

RESOLUTION OF MUTUAL INTENT BETWEEN
WEST VIRGINIA DIVISION OF ENVIRONMENTAL PROTECTION
WEST VIRGINIA SOIL CONSERVATION AGENCY
WEST VIRGINIA DIVISION OF FORESTRY
WEST VIRGINIA BUREAU OF PUBLIC HEALTH
WEST VIRGINIA BUREAU OF COMMERCE
U.S. ENVIRONMENTAL PROTECTION AGENCY
U.S. GEOLOGICAL SURVEY
U.S. OFFICE OF SURFACE MINING
U.S. FOREST SERVICE, MONONGAHELA NATIONAL FOREST
NATURAL RESOURCES CONSERVATION SERVICE
U.S. ARMY CORPS OF ENGINEERS

PARTNERSHIP FOR STATEWIDE WATERSHED MANAGEMENT

WHEREAS statewide watershed management is used to coordinate operations of existing water quality programs and activities in West Virginia to better achieve shared water resource management goals and objectives; and

WHEREAS on May 29, 1996 approximately 30 agency and program directors from state and federal water quality agencies in West Virginia attended the Statewide Watershed Management Workshop and concluded that many of the natural resource, administrative, and communication challenges they will face in the future could be better met through a cooperative watershed approach; and

WHEREAS participants of the Workshop formed the Interagency Watershed Management Workgroup which met monthly, from August 1996 through February 1997, to design a framework for coordinating watershed management activities; and

WHEREAS the Statewide Watershed Management Framework is a voluntary partnership for effectively and efficiently protecting water resources and does not alter the statutory or regulatory authority of participating agencies; and

WHEREAS the overarching vision for this Watershed Management Framework is coordinating efforts to enhance and preserve the state's water quality for the benefit of all citizens. These water quality benefits include maintaining public health; providing diversified recreational, educational, and scientific uses; and allowing economic growth; and

WHEREAS key to the success of the statewide management approach is for program and agency partners to build on and integrate their planning and resource management efforts, jointly working toward common goals.

BE IT THEREFORE RESOLVED that the undersigned partners intend to work in a cooperative spirit in implementing Statewide Watershed Management; and

BE IT FURTHER RESOLVED that, to the extent feasible, the undersigned partners intend to carry out their roles and responsibilities detailed in the *West Virginia Watershed*

Management Framework Partners' Guidance Manual and *Program Activity Guide*, including appointing representatives from participating programs to the Watershed Management Interagency Steering Committee and intend to expand the Framework as new partners wish to participate.

Goals of the Watershed Management Framework

The overarching vision for the Watershed Management Framework is coordinating efforts to enhance and preserve the state's water quality for the benefit of all citizens. These water quality benefits include maintaining public health; providing diversified recreational, educational, and scientific uses; and allowing economic growth.

Key to the success of the statewide management approach is for program and agency partners to build on and integrate their strategic planning and resource management efforts, jointly working toward common goals. West Virginia is designing and implementing a watershed framework to achieve four key goals.

Goal 1: Improve public awareness, understanding, and involvement

Elected officials and public agencies throughout the state seek public support for their technical, policy, and budgetary decisions. Currently, there is need for better communication between government and the stakeholders who live in each watershed. A consistent watershed planning process provides opportunities for meaningful public participation in water resource management decisions.

This improved communication should result in:

- More cost-effective management strategies with wider public acceptance;
- Increased public awareness of water quality issues and management responsibilities of state and federal agencies; and
- Increased awareness about local concerns, goals, and priorities.

Goal 2: Improve program efficiency

Improving the day-to-day efficiency of water resource programs is fundamental to watershed management. Because many water resource management programs operate under specific, narrowly defined mandates, program managers often make decisions without broader considerations. This fragmented response to water quality issues can result in duplicated effort, poor communication between programs and agencies, and conflicting priorities.

Many agencies' recent strategic plans have called for improved communication systems, mechanisms to promote employee understanding of overall agency policies and programs, the fostering of better cooperation and coordination among agencies, and efficient use of funding.

By coordinating efforts through a statewide watershed management approach, West Virginia can both improve staff communication and resolve many administrative efficiency issues, including:

- Coordination in setting priorities and establishing common goals among programs;
- Targeting of staff and funds to address high-priority concerns;
- Achieving more balanced workloads through clarifying responsibilities and synchronizing efforts with the watershed management cycle; and
- Reduced paperwork and effort to meet state and federal reporting requirements.

Goal 3: Increase program effectiveness (and cost-effectiveness)

In a climate of decreasing budgets and increasing demands, public and private agencies are searching for ways to make the best use of limited funds. In addition, citizens are asking for results. Implementing a statewide watershed management approach will increase the effectiveness of water quality programs by increasing data reliability, improving assessments, setting management priorities, fostering better criteria for implementing Total Maximum Daily Loads (TMDLs), broadening input to management solutions, and enhancing continuity in management decisions.

Goal 4: Improve information/data management

Natural resource management agencies have a wealth of existing data. This information, however, is maintained in a variety of formats by different entities, each with different levels and standards of quality control. This situation leads to a lack of knowledge about what data are (and are not) available and to duplication of effort in collecting and storing data.

Essential to statewide watershed management is efficiently bringing relevant, quality-assured information together in formats that are compatible, geographically tagged, and useful for decision making. The watershed management approach can provide a clear rationale and opportunity to improve overall data management, which in turn can support other goals such as increased program effectiveness and public support.

The West Virginia Watershed Management Workgroup developed these goals to guide the design of the Watershed Management Framework.

West Virginia's Geographic Management Units: 32 Hydrologic Regions

Partner programs and agencies in West Virginia will use a set of 32 hydrologic regions to provide a spatial focus for their activities (Figure ES-1). The hydrologic regions are the *largest watersheds* or geographic management units that the partners will use to organize and coordinate their efforts across the state. Key water quality activities such as scoping-level monitoring assessment, data management, permitting, and status reporting will be conducted at the scale of hydrologic region. These regions will be subdivided into smaller management units—subwatershed —where priority watersheds will be identified

for more focused data collection, analysis, management strategy development, and implementation.

Key Phases and Steps in the 5-Year Management Cycle

To establish a watershed management planning and implementation cycle, stakeholders must agree on a common series of steps or activities to follow. Figure ES-2 illustrates the cycle's 5 phases and the 10 steps that partners will follow for the West Virginia Watershed Management Framework. These steps allow programs, agencies, local organizations, and others to coordinate their activities, as well as to anticipate key events and meetings in the hydrologic regions and priority watersheds. The figure also shows strategic times in the 5-year cycle when watershed partners will conduct intensive public outreach.

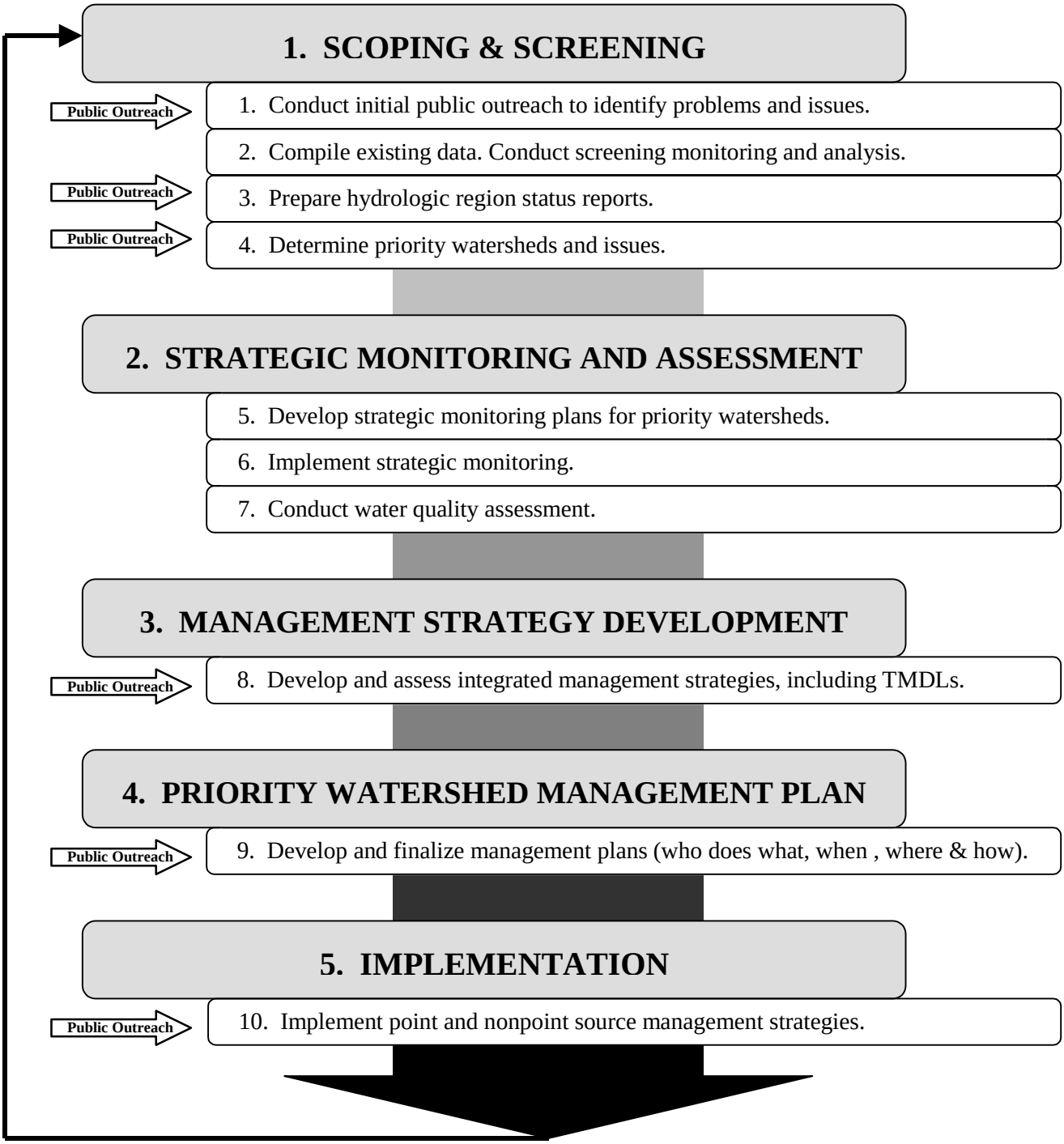
Stakeholder Involvement

A "stakeholder" is defined as any entity involved in or affected by watershed management activities. Although the West Virginia Office of Water Resources has legal responsibility for administering the federal Clean Water Act, the protection and restoration of the state's streams, rivers, and lakes depend on the collective efforts of citizens, businesses, and multiple government agencies. The Watershed Management Framework was designed to establish and support a strong partnership among agencies and organizations concerned about and responsible for managing the state's water resources. The Framework is also intended to ensure meaningful public participation in decision-making processes. Through establishing more cooperative working relationships and means for participation, the Watershed Management Framework strives to improve ways of identifying common water quality goals and problems and ways of implementing cost-effective solutions.

The Watershed Management Framework includes one central coordinating forum and multiple local forums to support stakeholder involvement. Central to supporting long-term stakeholder outreach and coordination is the Interagency Steering Committee (see Figure ES-3). Each partner agency or program will provide a contact person/representative to this steering committee to help ensure respective roles and responsibilities are met throughout the management cycles. Although partner agencies will be active in each step of the management cycle, the Steering Committee will meet as a body only three times during the cycle: to find common ground on priority watersheds and issues to work on together (Step 4); to finalize point and nonpoint pollution management strategies for priority watersheds (Step 8); and to finalize watershed management plans (Step 9). This watershed approach is designed for each partner program to reach out to its own government, business, agriculture, and public contacts and constituencies.

WV Watershed Management Cycle

Phases and Steps



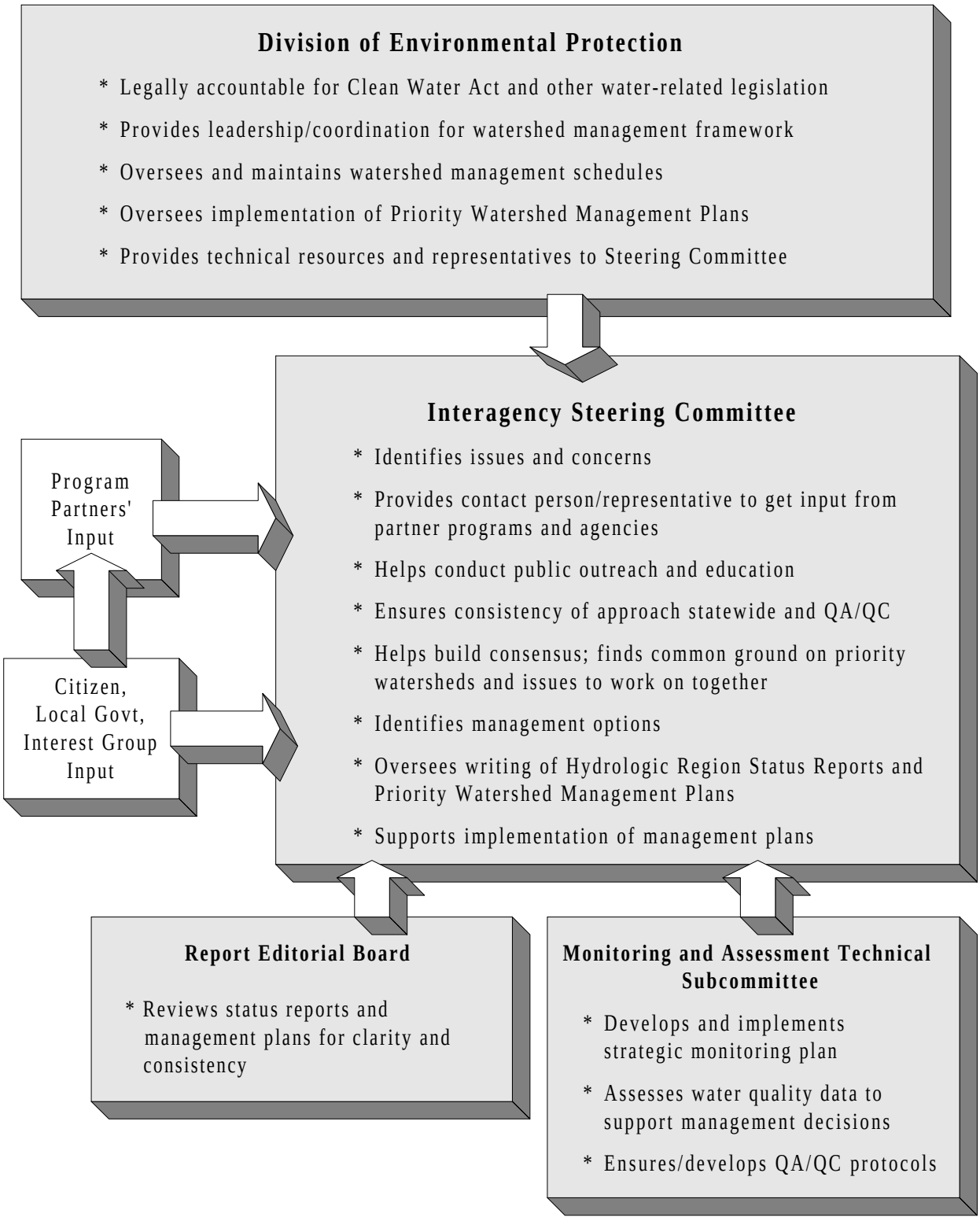


Figure ES-3. Recommended Stakeholder Involvement Watershed Management Support Structure

The Watershed Management Framework includes a sequence for phasing in and addressing watershed management units that balances geographic areas and workloads from year to year. Because the management cycle is 5 years, it targets approximately one-fifth of the hydrologic regions for conducting the scoping and screening phase, one-fifth for strategic monitoring and assessment, one-fifth for developing management strategies, one-fifth for developing priority watershed management plans, and one-fifth for beginning the implementation phase. Figure ES-4 shows these five groupings.

Over a 5-year period (1996-2000), the watershed management cycle will be phased in statewide. As illustrated in Figure ES-5, watershed planning activities will be initiated in all five hydrologic region groupings (A through E) by 2000. Figure ES-6 shows the schedule of activities during full, statewide implementation of the watershed management cycle (which should be reached in the year 2005 and continued in subsequent cycles). Achieving full implementation of the cycle does not mean that current activities and responsibilities in other areas will be dropped. Watershed management activities will be phased into the watershed management cycle over time. Also, not all water resource management activities will be synchronized or sequenced with the cycle—only those which make management more effective and efficient.

DEP initiated the scoping and screening phase for Group A hydrologic regions in 1996. In the future, as they carry out the management cycle statewide, partners will find that resource demands vary due to differences among hydrologic regions in the magnitude and complexity of environmental issues and the level of local interest.

Designed as a *tool* to support cooperative efforts statewide and to provide a baseline consistency for public outreach, monitoring, assessment, priority setting, and reporting, the Watershed Management Framework should be used with the flexibility needed to meet local and state watershed management needs as they arise. The *Guidance Manual for Watershed Management Partners* summarizes *mutually beneficial* procedures for working together on watershed management and should be revised periodically based on partners' experiences. Existing watershed partners will expand the Framework as new partners wish to participate and will collaborate with all interested parties.

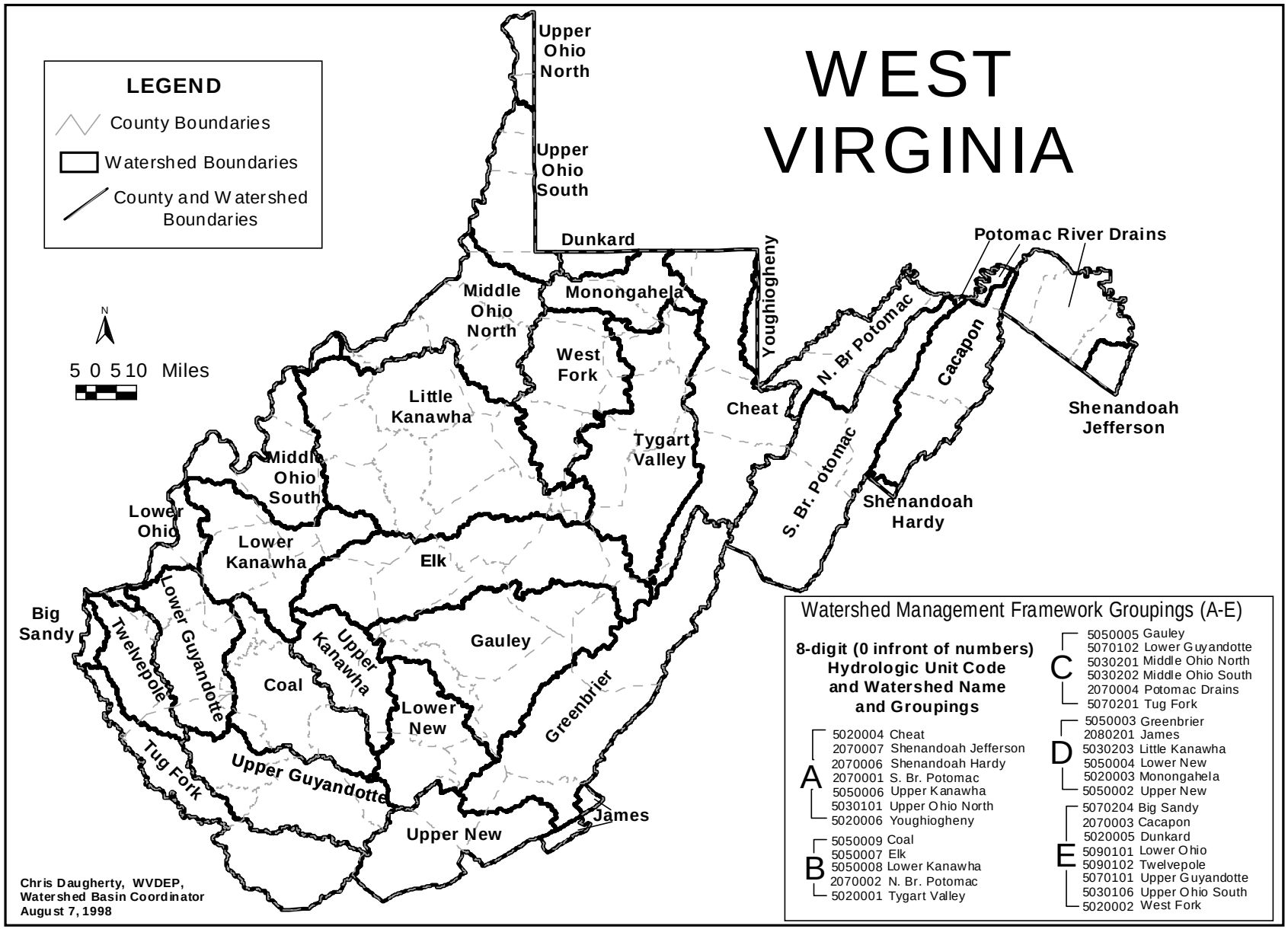

WEST VIRGINIA
LEGEND
County Boundaries
Watershed Boundaries
County and Watershed Boundaries
N
5 0 5 10 Miles
Upper Ohio North
Upper Ohio South
Dunkard
Middle Ohio North
Monongahela
Youghiogheny
Potomac River Drains
West Fork
Little Kanawha
Cheat
N. Br Potomac
Cacapon
Shenandoah Jefferson
Tygart Valley
Middle Ohio South
S. Br. Potomac
Shenandoah Hardy
Lower Ohio
Lower Kanawha
Elk
Big Sandy
Lower Guyandotte
Twelvepole
Upper Kanawha
Gauley
Coal
Lower New
Greenbrier
Tug Fork
Upper Guyandotte
James
Upper New
Chris Daugherty, WVDEP,
Watershed Basin Coordinator
August 7, 1998
Watershed Management Framework Groupings (A-E)
8-digit (0 infront of numbers) Hydrologic Unit Code and Watershed Name and Groupings
A
5020004 Cheat
2070007 Shenandoah Jefferson
2070006 Shenandoah Hardy
2070001 S. Br. Potomac
5050006 Upper Kanawha
5030101 Upper Ohio North
5020006 Youghiogheny
B
5050009 Coal
5050007 Elk
5050008 Lower Kanawha
2070002 N. Br. Potomac
5020001 Tygart Valley
C
5050005 Gauley
5070102 Lower Guyandotte
5030201 Middle Ohio North
5030202 Middle Ohio South
2070004 Potomac Drains
5070201 Tug Fork
D
5050003 Greenbrier
2080201 James
5030203 Little Kanawha
5050004 Lower New
5020003 Monongahela
5050002 Upper New
E
5070204 Big Sandy
2070003 Cacapon
5020005 Dunkard
5090101 Lower Ohio
5090102 Twelvepole
5070101 Upper Guyandotte
5030106 Upper Ohio South
5020002 West Fork

Figure ES-5. Phasing In Statewide Watershed Management Schedule

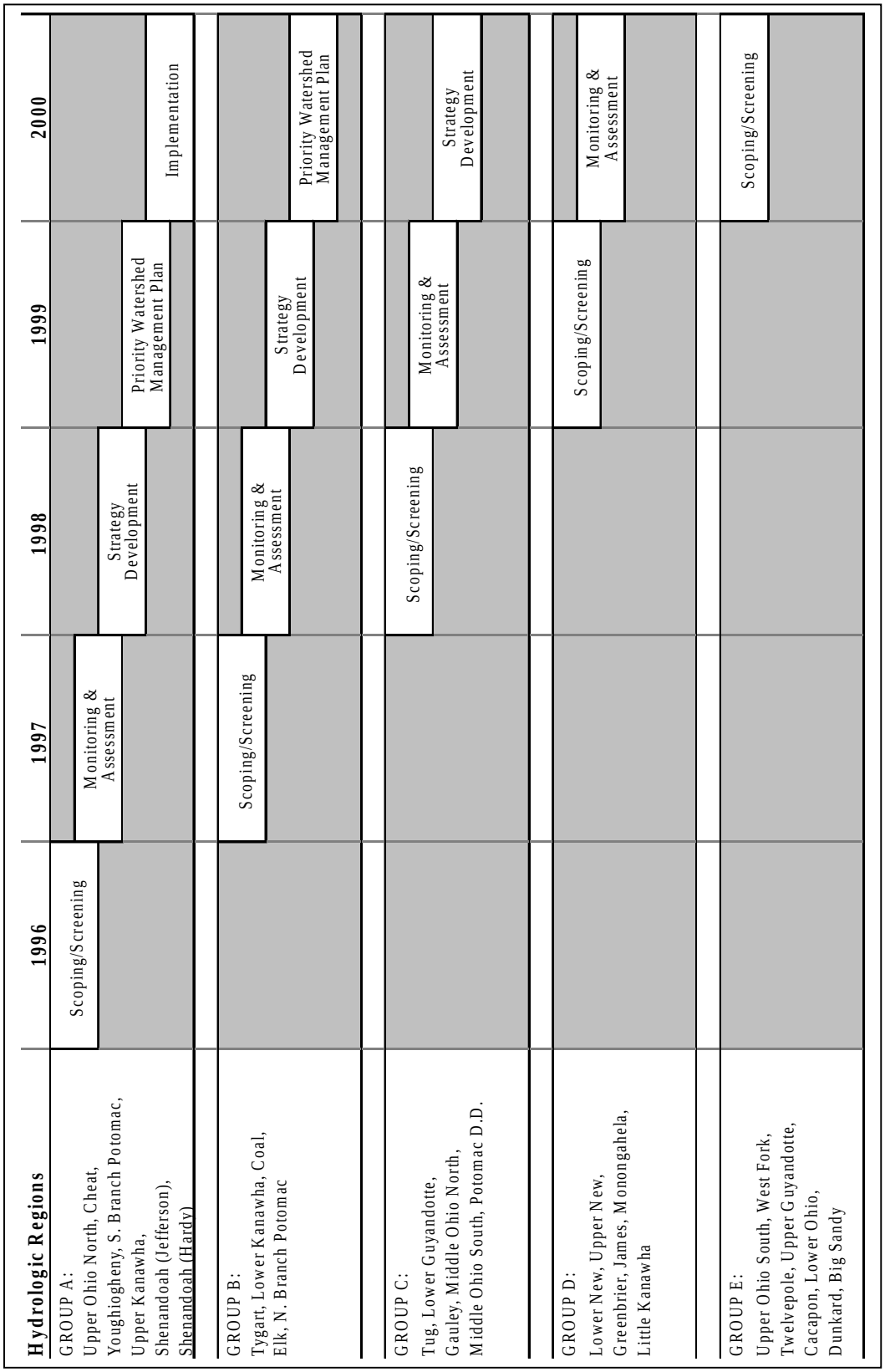
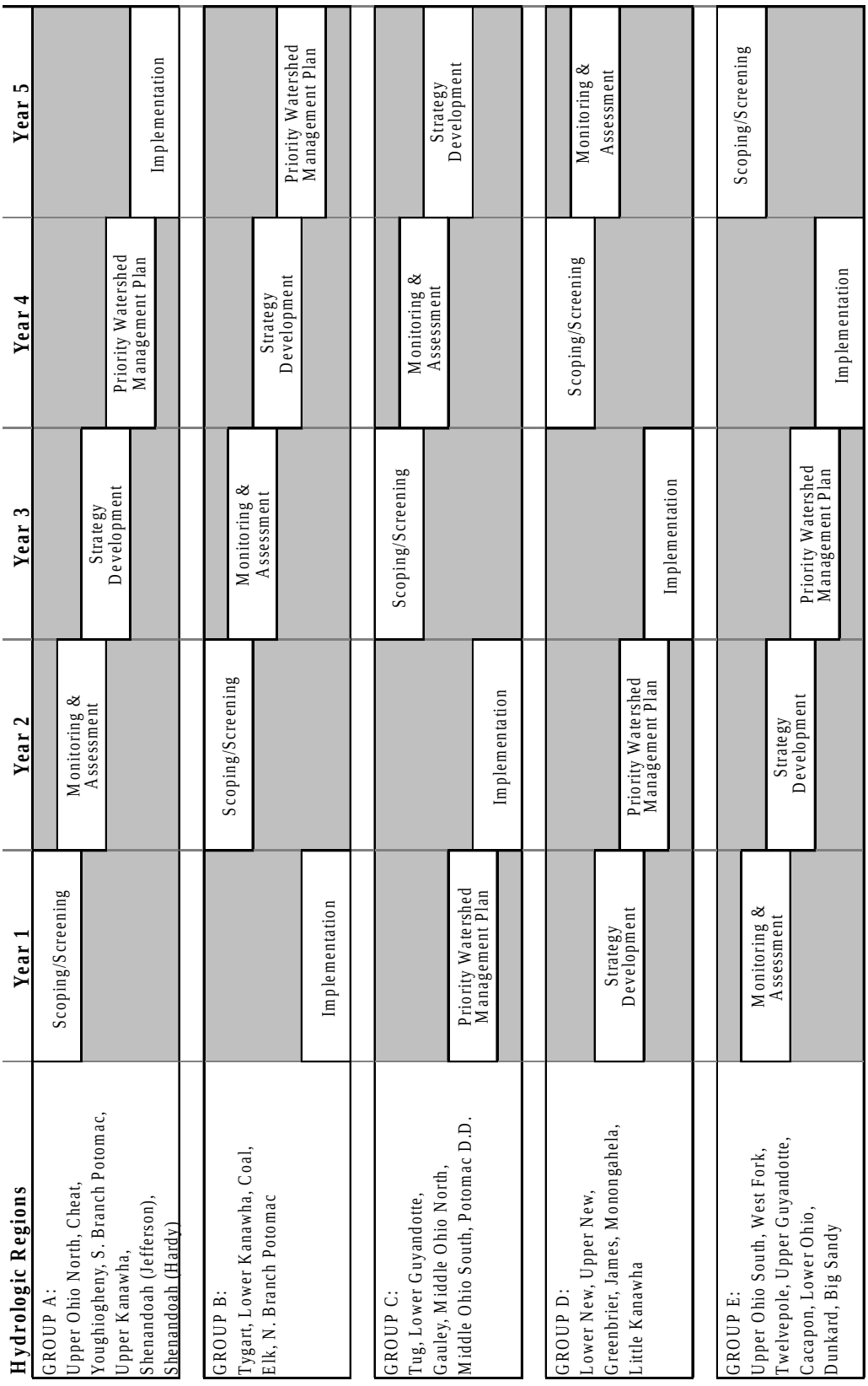


Figure ES-6. Full Implementation Statewide Watershed Management Schedule



III. TMDL PROGRAM

A lawsuit was filed against EPA in 1997 concerning West Virginia's failing to comply with the requirements of the Clean Water Act with regard to listing impaired streams (303d) not meeting water quality standards, and developing total maximum daily loads to bring these streams into compliance. A consent decree was negotiated and some of the following were results of the decree:

- Establish by September 30, 2006, TMDLs for all mine drainage impacted waters listed on West Virginia's May 9, 1996 draft Section 303(d) list (469 streams)
- Establish by September 30, 1999 TMDLs for the Upper Blackwater River, Ten Mile Creek, Buckhannon River, Tygart River, Kanawha river, Cheat River, North Branch of the Potomac River, and the New River.
- Establish by September 30, 2001, a TMDL for the Lower Blackwater River
- Establish TMDLs for at least 7 of the priority waters by September 30h of each year.
- Establish by September 20, 2000, a TMDL for 2,3,7,8-TCDD on those segments of the Ohio River which border Wet Virginia.
- Establish by September 30, 2002, TMDLs for any other pollutants of concern on those segments of the Ohio River which border West Virginia.
- Establish TMDLs for a total of 44 priority water quality limited streams by September 2002.
- In the first year of the Decree, if West Virginia fails to establish at least 7 such TMDLs by September 30, 1997, EPA may establish the balance of 7 TMDLs by December 31, 1997

An 18 month extension was granted by the plaintiffs in July 1998 for the mine drainage (AMD)impacted streams. Following became the AMD TMDL stream schedule:

- 100 AMD TMDLs by March 30, 2001
- 250 AMD TMDLs by March 30, 2006
- Balance of AMD TMDLs (~150) by March 30, 2008

At present, EPA has primary responsibility of ensuring that the TMDLs are written. West Virginia is working out a strategy for assuming primacy for the development of TMDLs. An action plan outlining the potential future TMDL development was outlined and submitted to EPA. The major crutch, so far, has been West Virginia's lack of resources to be able to control the TMDL program and requirements. This is also being addressed.

Short Term Scheduling:

The short term scheduling is mainly dependent upon the Consent Decree requirements. Following are the completed TMDLs and the predictions for the coming years to meet the Decree:

1997 - 7 TMDLs were completed (Blackwater R. and 6 Potomac fecal impacted streams)
1998 - 7 TMDLs were completed (Buckhannon R., Tenmile Creek, Lost River and 4 lakes)
1999 - 4 TMDLs were completed (Bear, Castleman, Turkey Run & Ridenhour Lakes)
5 TMDLs have been officially delayed but are considered an EPA responsibility for completion (Kanawha R., Armour Ck., Pocatalico R., Cheat R., and Tygart R.)
2000 - 8 TMDLs are planned for development by EPA's contractors. (Little Kanawha R. and 5 tributaries, Saltlick Pond, and Pat's Branch)

By 9/30/00 - 29 streams will have a TMDL developed on them (all of the above except Cheat and Tygart)
By 3/30/01 - 31 streams will have TMDLs developed as this is the deadline for the Cheat and Tygart

The short term needs will be addressed cooperatively by EPA and WVDEP. Possibilities for the next three years are outlined in the following table.

Short Term TMDL Schedule

YEAR	Pre-TMDL data collection	Proposed TMDL Development	TMDL Implementation
2000	(October1999 – March 2000) Little Kanawha Reedy Creek Spring Creek Sand Fork Oil Creek Saltlick Creek Saltlick Pond #9 Pat's Branch	Little Kanawha Reedy Creek Spring Creek Sand Fork Oil Creek Saltlick Creek Saltlick Pond #9 Pat's Branch	Ongoing from previous years TMDLs
2001	(October 2000 – March 2001) All streams in 2001 TMDL Development Block (April 2001- October 2001) Group A Biologically & Fecal Impaired Streams + Remaining AMD Waters (44)	Paint Ck (+14 AMD tribs) Elk River Shenandoah R. Stony River (+4 AMD tribs) Flat Fork Ck. Tug Fork (+63 AMD tribs) Monongahela R. (+ 37 AMD tribs)	Ongoing from previous years TMDLs

2002	(October 2001– March 2002) All streams in 2002 TMDL Development Block (April 2002 - October 2002) Group B Biologically & Fecal Impaired Streams + Remaining AMD Waters (27)	West Fork (+98 AMD tribs) Twelvepole Fourpole UT Robinson Run Lower Guyandotte (+5 AMD tribs) Gauley Dunloup UT Monongahela River.	Ongoing from previous years TMDLs

Long Term TMDL

The long term need corresponds to TMDL development in numerous Acid Mine Drainage impacted streams, biologically impaired streams, fecal coliform impaired streams and acid rain impaired streams. This long term need will require careful planning and execution if the TMDLs are to be systematically scheduled and developed. Arguably the best mechanism available to the state for this level of planning can be found within the principles of the West Virginia Watershed Management Framework. The following Table provides scheduling information for TMDLs which will be developed in the distant future.

LONG TERM TMDL SCHEDULE				
Year	**PRE-TMDL DATA THAT MUST BE COLLECTED IN THE GIVEN YEAR (BY HYDROLOGIC REGION)**	**TMDL DRAFTING**	**TMDL FINALIZED**	**TMDL IMPLEMENTATION**
2003	Group C – Biologically and Fecal impaired streams and remaining 19 Gauley River Acid Mine Drainage Impacted Streams	44 Remaining Group A Acid Mine Drainage TMDLs (3 Upper Ohio North, 1 Youghiogheny, 39 Upper Kanawha)		
2004	Group D - Biologically and Fecal impaired streams and remaining 7 Lower New River, 1 Upper New River, and 3 Little Kanawha Acid Mine Drainage Impacted Streams (11 Total)	27 Remaining Group B Acid Mine Drainage TMDLs (4 Lower Kanawha, 10 Coal, 4 Elk, 9 North Branch Potomac)	44 Remaining Group A Acid Mine Drainage TMDLs (3 Upper Ohio North, 1 Youghiogheny, 39 Upper Kanawha)	
2005	Group E - Biologically and Fecal impaired streams and the remaining 8 Upper Ohio South, 52 Upper Guyandotte, 2 Twelvepole, and 1 Dunkard Acid Mine Drainage Impacted Streams (63 Total)	19 Remaining Group C Acid Mine Drainage TMDLs (19 Gauley)	27 Remaining Group B Acid Mine Drainage TMDLs (4 Lower Kanawha, 10 Coal, 4 Elk, 9 North Branch Potomac)	44 Remaining Group A Acid Mine Drainage TMDLs (3 Upper Ohio North, 1 Youghiogheny, 39 Upper Kanawha)
2006	Group A	11 Remaining Group D Acid Mine Drainage TMDLs (7 Lower New River, 1 Upper New River, and 3 Little Kanawha Acid Mine Drainage Impacted Streams)	19 Remaining Group C Acid Mine Drainage TMDLs (19 Gauley)	27 Remaining Group B Acid Mine Drainage TMDLs (4 Lower Kanawha, 10 Coal, 4 Elk, 9 North Branch Potomac)
2007	Group B	63 Remaining Group E Acid Mine Drainage TMDLs (8 Upper Ohio South, 52 Upper Guyandotte, 2 Twelvepole, and 1 Dunkard)	11 Remaining Group D Acid Mine Drainage TMDLs (7 Lower New River, 1 Upper New River, and 3 Little Kanawha Acid Mine Drainage Impacted Streams)	19 Remaining Group C Acid Mine Drainage TMDLs (19 Gauley)
2008	Group C	Group A Biologically and Fecal Impaired Streams.	63 Remaining Group E Acid Mine Drainage TMDLs (8 Upper Ohio South, 52 Upper Guyandotte, 2 Twelvepole, and 1 Dunkard)	11 Remaining Group D Acid Mine Drainage TMDLs (7 Lower New River, 1 Upper New River, and 3 Little Kanawha Acid Mine Drainage Impacted Streams)

LONG TERM TMDL SCHEDULE				
Year	**PRE-TMDL DATA THAT MUST BE COLLECTED IN THE GIVEN YEAR (BY HYDROLOGIC REGION)**	**TMDL DRAFTING**	**TMDL FINALIZED**	**TMDL IMPLEMENTATION**
2009	Group D	Group B Biologically and Fecal Impaired Streams	Group A Biologically and Fecal Impaired Streams.	63 Remaining Group E Acid Mine Drainage TMDLs (8 Upper Ohio South, 52 Upper Guyandotte, 2 Twelvepole, and 1 Dunkard)
2010	Group E	Group C Biologically and Fecal Impaired Streams	Group B Biologically and Fecal Impaired Streams	Group A Biologically and Fecal Impaired Streams.
2011	Group A	Group D Biologically and Fecal Impaired Streams	Group C Biologically and Fecal Impaired Streams	Group B Biologically and Fecal Impaired Streams
2012	Group B	Group E Biologically and Fecal Impaired Streams	Group D Biologically and Fecal Impaired Streams	Group C Biologically and Fecal Impaired Streams
2013	Group C	Group A Acid Rain Impaired Streams	Group E Biologically and Fecal Impaired Streams	Group D Biologically and Fecal Impaired Streams
2014	Group D	Group B Acid Rain Impaired Streams	Group A Acid Rain Impaired Streams	Group E Biologically and Fecal Impaired Streams
2015	Group E	Group C Acid Rain Impaired Streams	Group B Acid Rain Impaired Streams	Group A Acid Rain Impaired Streams
2016	Group A	Group D Acid Rain Impaired Streams	Group C Acid Rain Impaired Streams	Group B Acid Rain Impaired Streams
2017	Group B	Group E Acid Rain Impaired Streams	Group D Acid Rain Impaired Streams	Group C Acid Rain Impaired Streams
2018	Group C		Group E Acid Rain Impaired Streams	Group D Acid Rain Impaired Streams
2019	Group D			Group E Acid Rain Impaired Streams

IV. CLEAN WATER ACTION PLAN (1998)

Overview from 1998

At the national level, the US Environmental Protection Agency (EPA) and the US Department of Agriculture (USDA), working through the state, were designated as the lead agencies charged with developing a unified watershed assessment and determining watershed restoration priorities and action strategies. Since WV has begun implementation of its *Watershed Management Framework* (*WMF*) and since the Interagency Watershed Management Steering Committee is composed of representatives from 12 state and federal agencies, the WV Division of Environmental Protection (DEP) and the Natural Resource Conservation Service (NRCS), both being agencies representing state interests, agreed that this core group with additional stakeholders such as the State Technical Committee, interstate commissions, a few other key governmental entities would be an appropriate vehicle for this initiative.

To evaluate and categorize the eight-digit watersheds, information was gathered, specifically from the DEP Office of Water Resource's Watershed Assessment Program. Category I watersheds (watersheds in most need of restoration) were determined primarily based upon the percent of stream miles assessed that were also impaired. The number of stream miles assessed per watershed was determined from the US EPA Waterbody System database. The number of stream miles impaired was based upon information from the WV 303(d) 1998 Impaired Stream List. The number of stream miles impaired for each watershed was calculated and those watersheds having 15% or greater impaired stream miles were considered Category I watersheds.

To determine the remaining watershed categorization, the Watershed Assessment Program's assessment schedule was evaluated. The schedule is based upon the *WV Watershed Management Framework* schedule. The 32 watersheds are separated into Groups A - E. Group A and B watersheds were assessed in 1996 and 1997, respectively. Assessed watersheds within Group A & B, that do not have a Category I designation, were given Category II ratings. These watersheds have been assessed and are considered to have decent water quality overall. Group C watersheds were to be sampled and analyzed in 1999/2000. Group D and E watersheds will be sampled and analyzed by the year 2000/2001. Group C, D, and E watersheds that do not have a Category I designation are given a Category IV designation. In 2001, these watersheds will be given a more representative categorization based upon more complete assessments, thus changing the IV's to I, II, or III's, many of which are anticipated to become I's. After the I's and IV's were determined those remaining watersheds without a designation were given a II rating. Of these remaining watersheds, none were considered to have generally pristine waters or considered primarily government land.

In future Unified Watershed Assessments, smaller 11-digit subwatersheds may be categorized versus the larger 8-digit watersheds. This will give a better indication of where activities are needed in more manageable sized areas.

To determine which watersheds would be considered priorities for the CWAP, participating organizations were asked to supply a list of their top ten watershed priorities and the criteria they used for selection. A statewide stakeholder meeting was held on July 15, 1998, to give input to the State to determine priorities.

Each organization determined their critical criteria and assessed the watersheds accordingly. All came back to the table and a matrix was designed to reflect the various resource interests. Categories used in making this decision are as follows: Agriculture, Forestry, Health, Mining, Natural Resources, Water Resources, WV Watershed Management Framework, and Public Stakeholders. After each column indicated the individual priorities, the matrix was evaluated and the committee determined which should become the priority watersheds. The top eight were chosen and these were: Cheat, Tygart Valley, West Fork, North Branch Potomac, South Branch Potomac, Elk, Upper Kanawha, and Little Kanawha Watersheds.

CWAP Update

For the 1999 and 2000 incremental monies, projects within the Cheat and the Little Kanawha were submitted. For the year 2001 incremental monies, the Watershed Management Framework schedule was looked at, and since Group B watersheds were slated for implementation in 2001, areas within the CWAP priority watersheds that also were within Group B were evaluated. The CWAP watersheds that fell into this were North Branch Potomac, Elk, and Tygart Valley. Subwatersheds within these watersheds are targeted for WRAS development and project submittal and implementation for year 2001.

For the year 2002 Group C watersheds are scheduled for implementation. During this time, all the Watersheds will have been assessed by the Watershed Assessment Program, and the Unified Watershed Assessment/Priority Watersheds for the CWAP may be modified to reflect the new information. Although there are no Group C watersheds that have been designated priorities through the CWAP, this will mostly likely change. The CWAP will also be more reflective of West Virginia's watershed planning schedule short and long term.

V. NINE KEY ELEMENTS OF THE WEST VIRGINIA NPS PROGRAM

The FY97 319 Program Guidance from EPA headquarters identifies nine key elements of an effective state NPS program and requires states to revise and submit their programs to reflect these elements. This section details how the activities of the West Virginia NPS program addresses these nine key elements.

1. The State program contains explicit short-and long-term goals, objectives and strategies to protect surface and ground water.

The State program includes:

The Mission Statement of DEP's Office of Water Resources (OWR): To enhance and preserve the physical, chemical, and biological integrity of surface and ground waters, considering nature and the health, safety, recreational and economic needs of humanity.

Specific watershed activities and measures will be addressed in separate watershed plans that are developed over the next 10 years as the statewide watershed process progresses through the state.

These specific activities and measures are related in goals and objectives from each category. Most of the nonpoint source projects will be implemented by category agencies in conjunction with the Watershed Management Framework according to their updated management plans:

Agriculture	Page 91
Construction	Page 117
Hydrological / Habitat Modification	Page 84
Land Disposal / On Site Disposal	Page 66
Resource Extraction	Page 143
Silviculture	Page 129
Urban Runoff	Page 88
Watershed Resource Center	Page 122

The overall goal of the statewide NPS Management Program is:

Goal 2 – 1: West Virginia will conduct restoration activities and best management practices implementation in the priority watersheds by 2020 as designated by the Watershed Management Framework and the TMDL process with the goal of achieving compliance with the Clean Water Act and fulfillment of all designated uses for all the state's watersheds.

Objective 1: The Nonpoint Source Program will continue to coordinate with all partner agencies and stakeholders on all nonpoint source projects on an annual basis.

Objective 2: Develop 2 to 5 Watershed Management Plans per year based on the WRAS's for the priority watersheds as designated by the Watershed Management Framework and TMDL processes. 2005

Objective 3: Have completed management plans for all 32 of the state's watersheds by 2015.

The goals of OWR's NPS Management Program are:

Goal 2 - 2: Annually update each existing category (agriculture, construction, silviculture, and resource extraction) and includes additional sub-category updates on sludge land application, basin wide management, hydrologic modification, urban stormwater and septic tank retrofit to allow use of SRF monies.

Objective 1: Category plans will be linked to clear watershed priorities as set by the Watershed Management Framework and the TMDL process by 2001. A Resolution of Mutual Intent for support of Watershed Framework Document has been signed by stakeholders involved in the statewide watershed approach including DEP, EPA and all NPS coordinating agencies. This letter of intent links NPS coordinating agencies in the support of watershed priorities and in the implementation of watershed plans established through the Framework process by the Watershed Management Framework committee.

Objective 2: List broad goals, objectives, and milestones with general expectations on when to complete the milestones - annually.

Objective 3: Each category update will describe link to statewide watershed process and development of holistic watershed management plans; it will also describe how programs will deal with the changing priorities coming out of the Watershed Approach – annually.

Goal 2 - 3: To assess the impact of nonpoint source pollution on the surface and groundwaters of West Virginia and to identify the specific causes of nonpoint source pollution by 2010.

Objective 1**:** Highlight the successes since original Management Plan (e.g. Logging and Sediment Control Act, Construction Stormwater NPDES Permit, Poultry Initiative, AMD Initiatives) by 2005.

Objective 2: Complete the assessment phase of the Watershed Management Framework and provide the interpretation necessary for the designation of priority watersheds and the development of Watershed Restoration Action Strategies by 2003.

Objective 3: To evaluate the effectiveness of the implementation of nonpoint source restoration and best management practices projects by 2010.

Objective 4: Support the Office of Water Resources' Citizen Volunteer Monitoring Program to train, equip and coordinate with the volunteer stream monitors - annually.

Short and long term goals are set primarily based upon the WV Watershed Management Framework priorities, Clean Water Action Plan priorities, and the TMDL development schedule.

2. The State strengthens its working participants and linkages with appropriate State, interstate, Tribal, regional, and local entities (including conservation districts), private sector groups, citizens groups, and Federal agencies.

- WVDEP's utilizes a Coordinating Review Board (CRB) to provide input into the NPS Program. The CRB consists of a representative from the Division of Forestry, State Soil Conservation Agency, Natural Resource Conservation Service, Ground Water Program, Watershed Assessment Program, Abandoned Mine Lands Program, Environmental Advocate Office, Nonpoint Source Program and EPA's 319 Project Officer. The CRB's role is primarily grant allocation and project development. The CRB evaluates project proposals based on the objectives of the NPS program and guides implementation, identifies specific BMPs for multi category targeted watersheds and resolves conflicts all in accordance to meeting Section 319(b)(2)(F) Federal consistency requirements.

- The NPS Program is also involved in the following NPS groups/efforts: Governors Stream Restoration Committee; The WV Save Our Streams Program; The Agriculture Conservation Farm Review Panel; The Construction Erosion and Sediment Control Award Committee; State Wellhead Protection Committee; WV Forest Resource and Conservation Committee; Mine Lands Public Water Supply Committee; Forestry BMP Adoption Committee; Logging Sediment Control Act Rules and Regulation Committee; WV Poultry Advisory Committee, ORSANCO, Ohio River Basin Commission, Pollution Prevention Round Table, West Virginia Watershed Network, Interstate Commission on the Potomac River Basin.

- The NPS Program is represented by a variety of NPS stakeholders on the WV Watershed Management Framework Committee to assist in assessing watersheds, setting priorities, and developing and implementing Watershed Management Plans. This holds true with the strategy development and selection of projects that will be proposed for the Clean Water Action Plan monies, as well as other funding sources. The Watershed Management Framework Committee evaluates data from all sources, public input and agency concerns to prioritize watersheds for the development of Watershed Restoration Action Strategies. The public is incorporated into this process by public scoping and screening meetings during Phase I of the Watershed Management Framework Cycle and during watershed strategy development meetings during Phase III. Watershed assessment reports and draft watershed strategic plans are presented and offered for public review and comment.

- The revised Nonpoint Source Management Program Plan will go out for public review and comment. The public is involved in most of the groups/efforts listed above that involves NPS program participation.

- Watershed Management Framework serves to communicate with the public and all stakeholders. The process begins with a public outreach meeting to learn from the public where their issues and concerns are and where they may want monitoring done.

- Public involvement information is also used when developing hydrologic region status reports and when prioritizing watersheds. Local stakeholder groups are set up during the development of watershed management strategies and plans for implementation.

- The public is also involved through the WV Citizen Volunteer Monitoring Program. Also, the State uses its partnerships effectively to avoid the transfer of problems among environmental media.

- The TMDL development process also has been working with the public to educate and solicit input.

- The NPS Management Plan includes all efforts statewide related to NPS, 319 funded and others.

3. The State uses a balanced approach that emphasizes both State-wide nonpoint source programs and on-the-ground management of individual watersheds where waters are impaired and threatened.

- Annual or multi-year work plans contain nonpoint sources implementation actions directed at both specific priority watersheds and activities of a statewide nature.

- Most of WVDEP's watershed projects for agriculture and construction have been in priority watersheds identified in the 1989 NPS Assessment and the WV Nonpoint Source Priority Watershed List from 1993. The workplans identify milestones for agriculture and/or construction activities and usually include a broad goal of coordination with other

management agencies if other NPS problems are present. These watershed projects focus on education and technical assistance to facilitate voluntary BMP implementation for agriculture and/or construction activities.

- WVDEP uses state funds to support and implement the NPS management program since its beginning. The West Virginia Division of Forestry utilizes 319 funds to implement their Nonpoint Source Program. The West Virginia Soil Conservation Agency matches 319 funded technicians with state-funded NPS Demonstration Projects and other state funded NPS Technicians. Another example of state funded NPS activities includes WVDEP's SRF Loan Programs for Agriculture and On Site Disposal activity.

- West Virginia uses an integrated watershed approach for assessment, protection and remediation that is integrated with other water and natural resource programs. The NPS Program, through the Watershed Assessment Program, coordinates watershed assessments with the schedule outlined in the Watershed Management Framework Document. Through this process watersheds that are impaired or threatened are identified. The Watershed Management Framework Committee then assesses needs, probabilities for success and public support to prioritize the watersheds for the Development of Watershed Restoration Action Strategies to address the specific problems in the priority watersheds. Members of the Committee represent all nonpoint category agencies and thus integrate Watershed Management Framework priorities into the respective category agency management plans.

- NPS program is heavily involved in not only the assessment and prioritization aspects of the Framework, but instrumental in providing resources to aid in the development of the watershed management strategies and plans and implementation of these.

- WVDEP fully uses the Grant Reporting and Tracking System to report on its 319 work program milestones. DEP regularly submits its Annual Report that summarizes the years 319 work program activities.

- Short and long term goals are set primarily based upon the WV Watershed Management Framework priorities, Clean Water Action Plan priorities, and the TMDL development schedule. TMDL's will impact the NPS watershed efforts by influencing the watersheds selected for restoration; it will accelerate the watershed restoration schedule and initiate implementation within two years where TMDLs are developed.

- Watershed process provides greater citizen/watershed group involvement and also supports involvement of the WV Watershed Network activities to support local watershed efforts and implementation activities.

4. The State program (a) abates known water quality impairments from nonpoint source pollution and (b) prevents significant threats to water quality from present and future activities.

- The State is finalizing its fifth year of comprehensively assessing the state's 32 hydrologic regions (watersheds). These assessments provide data that can identify reasonably

foreseeable water quality impairments and threats that are likely to be caused by nonpoint source pollution in the future. Under the Watershed Management Framework, priority watersheds will be determined. Based on these assessments watershed management strategies and implementation plans will be developed to address water quality impairments and threats from all pollutants, including NPS.

- The NPS strategies within TMDLs are being incorporated into the NPS programs and prioritized.

- State program addresses all significant nonpoint source categories and subcategories. All approved NPS categories (agriculture, construction, silviculture, and resource extraction) have been comprehensively updated in the new plan as well as the addition of hydrologic modification, urban runoff, and on site disposal categories.

- State program has identified specific programs to abate pollution from categories of nonpoint sources that cause or substantially contribute to the impairments identified in its assessments. This revised NPS Management Plan provides an update to this list and includes other programs now involved in the effort including AML and 10% set-aside, WAP, TMDLs, EQIP, and SRF.

5. The State program identifies waters and their watersheds impaired by nonpoint source pollution and identifies important unimpaired waters that are threatened or otherwise at risk. Further, the State establishes a process to progressively address these identified waters by conducting more detailed watershed assessments and developing watershed implementation plans, and then by implementing the plans.

- State water quality assessments (including those performed under section 304(b), 319(a), 303(d), 314, TMDL's and others), along with analysis of changing land uses within the State, form the basis for the identification of the State's planned nonpoint source activities and projects. Nonpoint source assessments were taken from these sources to generate the original 1989, Nonpoint Source Assessment Report. The state's NPS work program watershed-specific activities still correspond to the priority watersheds identified in the 1989 Assessment. These assessments (including the 1989 NPS Assessment) were also taken in account (along with other criteria) to establish the priority order for WAP to conduct their comprehensive assessments of the state's 32 hydrologic regions. WVDEP plans to update the NPS Assessment Report over the next five years as assessments are completed under the Watershed Management Framework in the 32 hydrologic regions. In addition, USDA reports, such as the 1995 NRCS East Region Natural Resource Assessment, and any others will be used to help target statewide efforts.

- State activities focus on remediating the identified impairments and threats, and on protecting the identified at-risk waters. The state's watershed activities have remained relatively constant over the last few years and are targeted in NPS priority agriculture and construction impacted watersheds. WVDEP uses Section 319 to fund Environmental Technicians in these priority watersheds to coordinate technical assistance and facilitate BMP implementation.

The State Soil Conservation Agency receives state funds for targeted demonstration projects to assist the technicians efforts in these priority watersheds. In addition, the Watershed Management Framework will develop further implementation plans in priority impaired, threatened, and at-risk watersheds.

- Provisions have been incorporated for public participation in the overall identification of problems to be addressed in the State program, and in the process to progressively address these problems. Public comment was sought on review of the 1989 Assessment Report and 1990 Management program and the state plans to do the same for the revised NPS Management Plan. The Watershed Assessment reports will also be distributed for public consumption and public involvement, this is built throughout the implementation process of the Watershed Management Framework approach.

- State nonpoint source priorities are communicated to, consistent with, and reflected in program planning and implementation activities by other water resource management agencies operating within the State. Existing cooperative relationships among DEP, DOF, and SSCA facilitate coordination among those agencies. SSCA also effectively coordinates with NRCS and the local conservation districts. The West Virginia Division of Forestry facilitate coordination with the U.S. Forest Service and the West Virginia Forestry Association and the DEP coordinates with the federal Office of Surface Mining. As stated earlier, the goal of the Watershed Management Framework is to promote consistent program planning and implementation of activities by all stakeholders in priority watersheds, including NPS. Through the agency coordination process, federal consistency with the state NPS Management Program will be met.

- Under this updated plan, the OWR will revise its identification of waters and revisit its process for progressively addressing these programs periodically (e.g., once every five years.). Establishment and implementation of **the Watershed Management Framework ensures that such a process occurs.**

6. The State reviews, upgrades, and implements all program components required by section 319(b) of the Clean Water Act, and establishes flexible, targeted, and interactive approaches to achieve and maintain beneficial uses of water as expeditiously as practicable.

The State programs include**:**

(a) A mix of water quality-based and/or technology-based programs designed to achieve and maintain beneficial uses of water; and
(b) A mix of regulatory non-regulatory, financial and technical assistance as needed to achieve and maintain beneficial uses of water as expeditiously as practicable.

- The State NPS Program identifies the agencies and measures to be used to control nonpoint sources of pollution. Each program focuses on those measures, which will be most effective to address the specific types of nonpoint source pollution prevalent in, their categories within the State. Through this process compliance to anti-degradation policy will be more attainable. These measures may be individually identified or presented in manuals or compendiums, providing they are specific and are related to the category or subcategory of nonpoint sources.

They may also be identified as part of a watershed approach towards achieving water quality standards, whether locally, within a watershed, or statewide. Implementation of the Watershed Management Framework process and development of implementation plans for priority watersheds will include measures to address the NPS and other problems identified.

- The State program includes processes to coordinate and, where appropriate, integrate various programs used to implement nonpoint source controls in the State. The following is a list of some of the documents that outline coordination mechanisms: the NPS Management Program Plan; MOA's with Cooperating Agencies; MOU's in the South Branch of the Potomac Watershed; Statewide Watershed Management Framework Document; MOU with State Soil Conservation Agency for the Agriculture SRF Loan Program.

- The State program reviews and identifies Federal programs and projects for their effects on water quality and their consistency with the State program.

- Monitoring and other evaluation programs have been implemented to help determine short- and long-term program effectiveness. The establishment of the Watershed Management Framework and the Watershed Assessment Program will provide the mechanisms to more comprehensively monitor the success of NPS watershed projects and establish better indicators for meeting water quality goals.

- OWR acts as lead agency and provides oversight to ensure implementation and effectiveness of all NPS management plans.

7. The State identifies Federal lands and activities which are not managed consistently with State nonpoint source program objectives. Where appropriate the State seeks EPA assistance to help resolve issues.

- The State program coordinates with and reviews Federal programs, development projects, and other activities that may address nonpoint categories for consistency with the State NPS Management Programs. The State NPS agencies work with Federal agencies to resolve potential inconsistencies between Federal programs and activities and the State programs. Where the State cannot resolve Federal consistency issues to its satisfaction, the Office of Water Resources will request EPA assistance to help resolve the issues. The State coordinates with Federal agencies to promote consistent activities and programs, and to develop and implement joint or complementary activities and programs.

- WVDEP works with its cooperating agencies to implement the NPS program. The SSCA works hand in hand with NRCS implementing watershed projects. The State also works with federal agencies (EPA, OSM, USGS). Should the need arise, the Section 319 Federal Consistency Guidance Manual, of August 26, 1998 will be utilized to resolve discrepancies.

8. The State manages and implements its nonpoint source program efficiently, including necessary financial management.

- The State's plans for watershed projects and statewide activities are well designed, with sufficient detail to assure effective implementation. In the Watershed Management Framework process assessment reports and watershed implementation plans will be developed for priority impaired and threatened watersheds. Implementation plans will include anticipated water quality improvements based on the best available knowledge so that future monitoring can be used to evaluate the effectiveness of the plans.

- The State's watershed projects focus on the critical areas, and critical sources within those areas, that are contributing to nonpoint source problems. The State's watershed projects are in watersheds primarily impacted by NPS pollution from agriculture and construction activities. The State implements its activities and projects, including all tasks and outputs, in a timely manner. The State uses the Grants Reporting and Tracking System (GRTS) to report semiannually on progress and status of 319 grants. The State has developed and uses a fiscal accounting system capable of tracking expenditures of both 319 funds and nonfederal match. Interim and final financial status reports are used to track grant expenditures. The State's interim and annual reports successfully portray the State's progress in meeting milestones. With the state's adoption of the Financial Information Management System (FIMS), section 319 grant funds are tracked and draw down on a monthly basis. With the addition of incremental 319 dollars going to small landowner projects, commitment modules through the FIMS will be created for tracking each project from start to finish.

9. The State periodically reviews and evaluates its nonpoint source management program using environmental and functional measures of success, and revises its nonpoint source assessment and its management program at least every five years.

- As previously described, implementation of the Watershed Management Framework shall provide such a process. The Watershed Assessment program assesses watersheds on a five-year cycle. The NPS Assessment will be continually updated on the five year cycle established in the Framework. Assessments from future cycles will be used to evaluate the effectiveness of NPS projects in priority watersheds.

- The State uses a feedback loop, based on monitoring and other evaluative information, to assess the effectiveness of the program in meeting its goals and objectives, and revises its activities and tailors its annual work plans, as appropriate. The Coordinating Review Board guides the implementation process and is able to regularly monitor the progress and effectiveness of the NPS program. The State updates the 305(b) Report every two years on NPS issues. Specific NPS Management program activities shall be incorporated and revised if appropriate through the implementation of the Watershed Management Framework. WVDEP regularly submits an annual report. This report summarizes the FY activities for the milestones outlined in the workplan.

VI. WEST VIRGINIA NONPOINTP SOURCE MANAGEMENT PLAN ON-SITE DISPOSAL

Background:

Septic tank soil absorption systems are the most widely used method of on-site domestic wastewater disposal in West Virginia. Septic tank systems or other systems besides public or community sewage systems serve 56 percent of all housing units in the state. A conventional septic system consists of a septic tank, a distribution box or equivalent branching lines and a series of subsurface absorption lines consisting of tile or perforated pipes laid in a bed of gravel.

All subsurface sanitary sewage systems are under the jurisdiction of the West Virginia Department of Health and Human Resources (WVDHHR) which was created by the Legislature's reorganization of the executive branch of State government in 1989. The Department of Health was renamed the Division of Health and made a part of the WVDHHR (W.V. Code 5F-1-1 et seq.). Administratively within the WVDHHR the Bureau for Public Health through its Commissioner carries out the public health function of the Division of Health.

On-site wastewater systems (septic tank soil absorption systems) have been identified and approved in the first Nonpoint Source Management Document as a nonpoint source pollutant. The on-site wastewater systems are under the jurisdiction of the state and county health departments.

Goal 2 - 4: Implement a pilot project to serve as a template for the establishment and refinement of a state wide program to replace or repair failing septic systems by 2015.

Objective 1: Provide low interest state revolving fund loans to resident homeowners requiring financial assistance for the improvement, repair, or replacement of individual on-site wastewater disposal facilities where public health or water quality problems exist and where it is not physically feasible to connect to a public wastewater treatment system. 2002

Objective 2: Assess the success of the pilot project and make adjustments as necessary for a statewide program. 2003

Implementation:

The design standards apply to the site requirements, design, construction, and maintenance of individual sewage treatment systems including septic tank soil absorption systems with standard soil absorption fields; serial distribution soil absorption fields; soil absorption beds; shallow soil absorption fields; mound systems; home aeration units; effluent disposal ponds; composting toilets; grey water disposal systems; holding tanks; privies; recycle systems or any other systems which provide waste treatment and disposal for individual dwellings and commercial establishments.

Application forms and design data sheets may be obtained from the local health department.

1.1. For systems utilizing soil absorption or on-site effluent disposal, one (1) copy of the completed application, design data sheet, and plan shall be submitted to the director.

1.2. For systems utilizing other methods of effluent disposal, six (6) copies of the completed application, design data sheet, and plans shall be submitted to the director.

2.0. General Site Requirements

2.1. No part of an individual sewage system shall be located in a poorly drained or filled area, or in any area where seasonal flooding occurs, without the prior written approval of the director. Exceptions may be made if the fill area has been constructed in accordance with directions of the director or evidence has been provide to the director that the fill area is suitable and of acceptable composition.

2.2. No part of an individual sewage system shall be located within 10 feet of a building, foundation, or property line.

2.3. No part of an individual sewage system shall be located within 25 feet of a public water supply line, or within 10 feet of a private water supply line.

2.4. The distance between a septic tank, home aeration unit, vault privy, or other sewage tank and a public water system well or water supply shall be as determined by the director.

2.5. A septic tank, home aeration unit, vault privy, or other sewage tank shall be located at least 50 feet from a private well or groundwater supply.

2.6. Absorption fields, serial distribution systems, absorption beds, mound systems, and other soil absorption systems shall be located to comply with the following distance.

The following section details the pilot project that will help guide SRF nonpoint efforts to address failing septic systems in West Virginia.

FUNDING ON-SITE SEPTIC DISPOSAL SYSTEM REPAIRS AND REPLACEMENTPILOT PROGRAM

By the

WEST VIRGINIA WATER POLLUTION CONTROL REVOLVING FUND

INTENT

The intent of this pilot program is to provide low interest state revolving fund loans to resident homeowners requiring financial assistance. This is supported through authorization of the West Virginia Code Article 2 Chapter 22-C and the approved Non Point Source Management Plan. Loan proceeds will be used for the improvement, repair, or replacement of individual on-site wastewater disposal facilities where public health or water quality problems exist and where it is not physically feasible to connect to a public wastewater treatment system within a certain timeframe.

PURPOSE

County health departments (CHD) will work with the WV Division of Environmental Protection, Office of Water Resources (DEP), to promote and recommend those in need of assistance to environmentally clean up or remove health hazards due to direct discharges or failing septic systems by replacement or repair.

USES

Types of eligible activities include the repair or installation of septic tank-soil absorption systems, sand filters, mound systems, and other innovative or alternative on-site systems for households disposing solely of sanitary (domestic) waste. Local health officials must approve the installations or improvements as an acceptable means of resolving the problem.

Types of ineligible activities are Class 5, Underground Injection Control wells, new housing projects, or home aeration units with direct discharge to surface waters. This list is not all-inclusive and determinations on those activities not listed will be on a case by case basis.

ADMINISTRATION OF THE PROGRAM

The WV Division of Environmental Protection, Office of Water Resources, will be the lead agency responsible for the general oversight and fiscal management of the On-site Systems Loan Program (OSLP). The County Health Departments (CHD) will be the lead agency responsible for the day to day technical management and oversight of the construction and operation of the facilities.

The DEP will coordinate the OSLP by performing the following functions:

Construction Assistance will:

- update the Intended Use Plan and Priority List to include these projects,
- make OSLP loans available to participating financial institutions for projects in the state, and
- monitor the status of the loans made.

Coordination and Development will:

- provide technical and administrative assistance relative to implementing the On-site system program through an agreement with the State Bureau for Public Health that will include water quality monitoring and public education activities,
- review and obtain approval for the WV Non-point Source Management Plan from the EPA, and
- monitor the fulfillment of the terms of the program between the health departments and the DEP.

The participating financial institutions will coordinate the financial management of the OSLP to the applicant by performing the following functions:

- request and evaluate credit of OSLP applicants to determine loan eligibility based upon the institution's criteria,
- collect the administrative fee from the loan recipient and remit to the DEP (see appendix for chart),
- disburse loan proceeds and collect loan repayment from homeowners,
- repay the loans to the SRF program in accordance with the SRF prepared amortization schedule, and
- provide financial reports as required.

The County health departments will work in cooperation with the DEP and financial institutions to implement and manage the OSLP by performing the following functions:

- provide public education on the types of projects and availability of funding,
- provide technical assistance and approve the on site system chosen,
- determine eligibility of project by issuing a certification of qualification to loan applicants that may include a requirement for "life of loan maintenance contract" (if necessary),
- provide the homeowner with the name of the participating financial institution,
- coordinate the monitoring of the project and provide information to the DEP and financial institutions, as necessary;
- inspect the construction for compliance and provide reports to DEP, and
- make appropriate determinations if noncompliance is detected from the loan recipients and correct the noncompliance.

The loan recipient's responsibilities are as follows:

- contact the applicable health department and complete the initial application,
- contact the sewer authority for the area to complete the "no service statement" and return the statement to the health department,
- enter into a maintenance agreement (if required by the County),
- contact the participating financial institution for a loan application,
- repair/replace/install the new septic or alternative system, and
- repay the financial institution as scheduled.

ELIGIBILITY REQUIREMENTS

Loans may only be made to applicants who are the owners of record of the property. The property must be in the State of West Virginia. Upgrades, replacements, or repairs will only be made to existing on-site systems. Existing homes with no treatment facilities are eligible for new systems. The repair cannot be a part of interior home plumbing or remodeling. There must be a water quality or health hazard issue for the project to qualify. The cognizant county health department will have to certify the failure of the system. There must also be an acknowledgement by the local sewer authority that service is not feasible within five years.

TERMS AND CONDITIONS RELATING TO ALL LOANS

1. This is a pilot program being developed with the assistance of the Beckley-Raleigh Health Department and will be limited to this county for the first year.

2. The pilot program will be effective for one year commencing in March 2000.

3. The maximum amount available for this pilot program is $500,000.

4. The total amount of any one loan will not exceed $10,000.00.

5. Allowable costs include the DEP registration fee and the County permit fee. Maintenance agreement costs are not allowed.

6. The interest rate charged by the financial institution to the homeowner will not exceed two percent (2%).

7. The term of the loan will not exceed seven (7) years.

8. Construction must be completed within 180 calendar days of receiving the loan proceeds.

9. The principal (loan amount) of the OSLP may be prepaid at any time without penalty.

GENERAL STATEMENT

All programs and services of the agencies participating in this program are provided on a nondiscriminatory basis, without regard to race, color, religion, age, sex, marital status, handicap, or national origin.

APPENDICES

Letter of No Service

Health Department Tracking Log

Health Department Application

Certificate of Qualification

Health Department Inspection Report

Financial Institution Monthly Report

Flowchart

Administrative Fee Chart

[LETTERHEAD OF UTILITY PROVIDER]

[DATE]

_____County Health Department
(address)
(city, state, zip)

RE: Application for Service/No Service

To Whom It May Concern:

_____
(name of applicant)

residing at _____

_____

has requested connection to _____'s wastewater system. The {city} {town}{District} does not provide service to the area in which the applicant is located and does not reasonably anticipate that it will provide service to that area within the next five years.

Very truly yours,

{Name}
{title}

West Virginia On-Site Wastewater Disposal Water Quality Loan Program

_____ County Health Department

Period beginning _____ through _____

Name or Borrower(s)	Application Sent	Application Rec'd	Action Date	Disposition	Bank Selected	Bank Disposition	Loan Amount

LOG due to SRF Coordinator by LAST DAY of the month

CONFIDENTAL

7

HEALTH DEPARTMENT TRACKING LOG

1. This form will be used to track the status of the applications.

2. The form is to be completed by the local Health Department on a monthly schedule.

3. Send the original form to the WVDEP SRF Coordinator by the last day of each month.

4. Retain a copy of the form to be filed at the local Health Department office.

5. The form is to be completed as follows:

Column 1 -- Name of applicant(s) - Enter the name or names of individuals making application.

Column 2 -- Application sent - This is the date the local Health Department distributed the application to the applicant.

Column 3 -- Application received - This will be the date that the local Health Department received the completed application from the applicant(s).

Column 4-- Date of action - This is the date the local Health Department took action of the application “approval” or “denial”.

Column 5 -- Disposition - Enter “approved” or “denied”.

Column 6 -- Bank selected - Enter the name of the bank with which the applicant plans to make credit application. This can be completed after the bank returns the completed certificate of qualification.

Columns 7 -- Bank disposition - Once the completed certificate of qualification is received from the bank enter “approved” or “denied”.

Column 8 -- Loan amount - Enter amount of loan.

_____ COUNTY HEALTH DEPARTMENT
WV DIVISION OF ENVIRONMENTAL PROTECTION

ON-SITE WASTEWATER QUALITY LOAN PROGRAM

DATE

APPLICANT:_____ CO-APPLICANT:_____
ADDRESS:_____
ADDRESS:_____

Describe the problem:

CHECK THE APPROPRIATE WASTEWATER DISPOSAL TO BE APPROVED:

1. ___SEPTIC TANK-SOIL ABSORPTION SYSTEM
2. ___OTHER ALTERNATIVE ON-SITE SYSTEM (SPECIFY)

A maintenance agreement required by the County Health Dept. Yes ____ No ____

NOTICE TO APPLICANTS:

*APPROVAL OF THIS PROJECT APPLICATION BY THE COUNTY HEALTH DEPARTMENT (CHD) DOES NOT CONSTITUTE THE APPROVAL OF THE LOAN. UPON APPROVAL OF THE PROJECT YOU WILL BE INFORMED OF THE PARTICIPATING BANKING INSTITUTION THAT YOU MAY APPLY FOR A CREDIT APPLICATION.

AS PART OF THE ON-SITE WASTEWATER QUALITY PROGRAM YOU MUST AGREE WITH THE FOLLOWING STATEMENTS:

1-THE PROJECT THAT YOU ARE APPLYING FOR WILL HAVE A POSITIVE IMPACT ON WATER QUALITY.
2-THE PRACTICE WILL BE CONSTRUCTED TO 64CSR9 STANDARDS.
3-THE PROJECT WILL BE INSPECTED BY CHD AND/OR WVDEP DURING AND AFTER CONSTRUCTION.
4-THE PROJECT WILL BE MAINTAINED FOR THE TERM OF THE LOAN.
5- IT IS THE HOMEOWNER'S RESPONSIBILITY TO FINANCE THE MAINTENANCE CONTRACT COSTS. THIS IS NOT AN ALLOWABLE LOAN ITEM.

PLEASE SIGN THAT YOU HAVE READ AND UNDERSTAND THE ABOVE STATEMENTS:

APPLICANT:_____ CO-APPLICANT:

FOR OFFICE USE ONLY:

WASTE MANAGEMENT PRACTICE APPROVED: 1___ 2 ___

I HAVE REVIEWED THE ABOVE-MENTIONED PROJECT AND CERTIFY THAT IT IS IN COMPLIANCE WITH WEST VIRGINIA DEPARTMENT OF HEALTH, LEGISLATIVE RULE, 64CSR9 'SEWAGE SYSTEM, SEWAGE TREATMENT SYSTEMS, AND SEWAGE TANK CLEANERS.'

APPROVED BY:_____ DATE :_____

_____
COUNTY HEALTH DEPARTMENT

LOAN APPLICATION PROCEDURES

1. The local Health Department will process the application for assistance. The homeowner will be advised to get a “No service” letter from its sewer service authority.

2. Application will be completed by the applicant(s) and returned along with the “No Service” letter to the local Health Department for approval. The health department will assist the homeowner in determining the type of system necessary to correct the discharge.

After approval, a certificate of qualification (3-part form) will then be issued, cost estimates

will be obtained, and the homeowner will be advised to contact the participating financial institution.

3. The applicant will take the certificate and the “No service” letter to a participating financial institution for loan approval procedures.

WV OSLP

CERTIFICATE OF QUALIFICATION

THIS CERTIFIES THAT THE NAMED APPLICANT (S) HAS MET THE STANDARDS TO APPLY FOR A WEST VIRGINIA ON-SITE WASTEWATER QUALITY LOAN.

APPLICANT (S) _____

ADDRESS:

_____

_____

THIS CERTIFICATE MUST BE PRESENTED WITHIN 60 DAYS TO THE PARTICIPATING FINANCIAL INSTITUTION WHEN MAKING A CREDIT APPLICATION

THE FOLLOWING MANAGEMENT PRACTICE HAS BEEN APPROVED:

ESTIMATED COST

1. ___ SEPTIC TANK-SOIL ABSORPTION SYSTEM _____

2. OTHER ALTERNATIVE TECHNOLOGY: _____

3. OTHER __DEP Registration fee _____

County Permit fee _____

Approval of this project by the County Health Department does not constitute the approval for a loan.

_____ County Health Department On-site Sewage Disposal Permit No.

Address _____

_____

Approved by: _____ Date: _____

==========

NOTICE TO THE FINANCIAL INSTITUTION:

FIRM: _____ LOAN APPROVED:

ADDRESS: _____ YES _____ NO _____

_____ AMOUNT: _____

PHONE/FAX: _____ DATE: _____

APPROVED BY: _____

TITLE: _____

CHD FORM WVOSLPCERT-99

CERTIFICATE OF QUALIFICATION

1. This is a three-part form. The top part of the form is to be completed by the County Health Department. It is to be sent in its entirety to the financial institution for completion of the bottom half of the form by the financial institution.
2. Other costs allowed include the permit fee and the seal registration fee.
3. The certificate of qualification is to be given to the applicant once the application has been approved by the local health department.
4. The applicant will present the partially completed certificate and the "No service" letter to apply for credit at the financial institution.
5. The financial institution will perform its credit review and complete the bottom portion of the certification. The original (top) sheet is to be returned to the Health Department. A copy goes with the documents to DEP, and the final copy is retained by the financial institution.
6. The local health department will use the bottom information to complete their tracking form.
7. The certificate of qualification will be filed with the applicant's file at the health department.

WV OSLP INSPECTION

_____ COUNTY HEALTH DEPARTMENT

LOCATIONAL COORDINATES:
LATITUDE: _____

LONGITUDE: _____
METHOD USED TO OBTAIN COORDINATES:

_____

HOMEOWNER: _____ WVDEP Septic Tank Seal Registration (if applicable)

ADDRESS: _____

_____

_____

____

Date

_____

TYPE:

_____ PRE-SITE INSPECTION / PRECONSTRUCTION PHASE

_____ SITE INSPECTION /CONSTRUCTION PHASE

PERCENTAGE CONSTRUCTION COMPLETE _____%

_____ FINAL CONSTRUCTION INSPECTION

EVALUATION (Include pictures if possible):

IS THE PROJECT IN COMPLIANCE AND MEETING THE OVERALL PLAN? YES _____ NO

IF NOT, THE FOLLOWING ACTION IS REQUIRED:

INSPECTED BY: _____

REVIEWED BY: _____

_____COUNTY HEALTH DEPT.

CHD FORM WVOSLPINSP - 99

PROJECT INSPECTION FORM

1. The appropriate individual making site inspections on the project approved for construction shall complete this three-part form.
2. The inspections are required to insure that the applicant is following the rules for the installation of on-site sewage disposal systems in accordance with Health regulations and in compliance with the West Virginia On-Site System Loan Program.
3. There will be a minimum of two such inspections made on the project :
   - preparation of the site
   - final inspection when the project is installed but prior to backfill completion.
4. the form is to be completed as follows;
   a. Date – list the date of inspection
   b. Coordinates – list the geographic coordinates on the system in latitude and longitude in degrees, minutes, and seconds to the nearest second, and the method used to determine such coordinates.
   c. Homeowner – list the name(s) of those receiving assistance.
   d. Address – list the address of the homeowner.
   e. WVDEP Septic Tank Seal Registration – list the number of the registration and the date.
   f. Check the appropriate type of inspection.
   g. Written evaluation – give a short narrative evaluating the project. Include pictures if possible.
   h. Mark the appropriate line reflecting compliance status.
   i. If not in compliance, explain what is required in order to meet compliance, noting the timeframe of compliance deadline.
   j. Inspector is to sign and date the form upon completion.
   **Attach an additional sheet if required.*
   k. Health department to sign and date the report. Send a copy of the report to the DEP and the financial institution. The third copy will be retained in the homeowner's file.

ON-SITE WASTEWATER QUALITY LOAN PROGRAM TRACKING
For the Month ending _____

Name of Financial Institution: _____

Address: _____

Phone/Fax _____

E-mail _____

Name of Applicant	Amount of Loan Requested	Action Taken	Date Loan Closed

CONFIDENTIAL

BANK TRACKING FORM PROCEDURES

1. This tracking form is to be completed by the financial institutions that signed agreements to process the state revolving loans.

2. This form is to be completed and updated on a monthly basis and sent to:

   WV DEP – Construction Assistance Programs
   617 Broad St
   Charleston WV 25301

   at the end of the quarter. If there is no activity, just mark " NO ACTIVITY".

3. The form is to be completed as follows:

   Column 1-- Name of applicant - Enter the name or names of individuals applying for loan.

   Column 2 --Amount of loan request - Enter the amount the applicants(s) wish to borrow.

   Column 3 --Action taken - Enter "approved" or "denied" and the date.

   Column 4 --Date loan closed - Enter the date the loan was closed and funds distributed.

ADMINISTRATIVE FEE CHART for the Division of Environmental Protection

This fee is collected by the financial institution on the day of loan closing. This fee may be included in the loan amount dispersed by the financial institution but will not be included in the funds received from the DEP.

The amount of administrative fee to be collected is calculated based on the size of the loan and the loan terms.

FEE CHART SCHEDULE

LOAN SIZE	BASE FEE
$1 TO $5,000	$ 25
$5,001 TO $10,000	$ 35

plus a $35 per year increment beginning with year 2.

Examples: a $4,000 for 3 years would have a fee of $25 + (35*2) = $ 95.00

A $9,757 for 5 years would have a fee of $35 + (35*4)= $175.00

This is a one-time charge to the homeowner

VII. WEST VIRGINIA NONPOINT SOURCE MANAGEMENT PLAN HYDROLOGIC HABITAT MODIFICATION

Background

The Federal Clean Water Act requires that for each permit or license issued by a federal agency that the State is to provide certification that its water quality standards and the use of the water will not be impaired by issuance of the federal permit. The State in its certification may grant, grant with conditions, waive, or deny certification. The 401 refers to Section 401 of the Clean Water Act which is the statutory basis for activities.

Most certifications are issued for either a Clean Water Act Section 404 Permit (dredge/fill) or a Federal Energy Regulatory Commission Permit. The 404 Permit is issued by the U.S. Army Corps of Engineers from either the Huntington or Pittsburgh District Offices. However, the Coast Guard issues the 404 permit for bridge construction on navigable waterways. FERC licenses all hydropower facilities.

Water quality impacts from natural and man-induced hydrologic modifications are a significant concern in certain watersheds across the state. Streambank restoration, channel modification and any in-stream work related to reduction in water quality impacts are addressed through the Nonpoint Source Program's hydrologic modification category. Certain activities are regulatory in nature requiring a 404 permit with subsquent certification by the state water quality agency under Section 401 of the Federal Clean Water Act. However, the vast majority of potential hydrological modification water quality impacts occur from eroding streambanks, accumulated sediments blocking channel flows, natural or man-induced blockages and unrestricted access by domestic animals.

Organizational Structure:

401 certification activity is operated out of the West Virginia Division of Environmental Protection - Office of Water Resources, Nonpoint Source Section with field support by the West Virginia Division of Natural Resources, Wildlife Resources Section. There are two individuals assigned to the program in the Office of Water Resources and four Wildlife Resources staff available for field reviews at proposed activities. The Nonpoint Source Program will prepare 404/401 certification for approval by the Chief of the Office of Water Resources.

The Corps and the State have established a Regional Landowner Stream Restoration Permit. The regional permit authorizes a similar set of activities usually associated with stream restorations, including: excavation of silt, sand or rock deposits; reduction of sand and gravel bars; bank stabilization; channel restorations; and maintenance of approved work. Individuals interested in using this regional permit for work in streams on their property must contact one of the WV Soil Conservation Districts to request technical assistance in developing a stream management plan.

The Landowner Stream Access Program establishes the process for landowners who notify their Soil Conservation District (SCD) of their intention to work in a stream. On-site technical assistance identifies the problem, develops plans to remediate the in-stream problem and makes recommendations on off-site land uses which may prevent a reoccurrence of the problem. Generally, the technical assistance provided results in a resolution not requiring a permit. However, in some instances where stream channel relocations and other in-stream work are required a landowner stream access permit is issued. The landowner stream access permit allows for an expedited issuance for projects not exceeding excavation of 3000 cubic yards of material, does not exceed accumulative total of 1000 linear feet of stream bank and does not exceed an average of one cubic yard of fill per running foot per running foot placed along the bank below the plane of the ordinary high water mark. For landowners who are not required to obtain a permit then nonpoint source assistance can be provided by the SCD. The process is represented in the flow chart on the following pages.

Long-term Initiative:

The Nonpoint Source program seeks to reduce the regulatory burden on landowners and public officials, the cost to regulatory agencies, while maintaining high water quality, designated uses and reduce problems associated with flooding, sedimentation and streambank erosion.

Goal 2 – 5: Enforce the 404 permit through the 401 certification with compliance and technical assistance from the WV Soil Conservation Agency, WV Division of Natural Resources and the US Fish & Wildlife Service to achieve at least 90% compliance by 2005.

Objective 1: Provide technical assistance with in-stream management plans for approximately 200 landowners annually. – 2001 - 2003

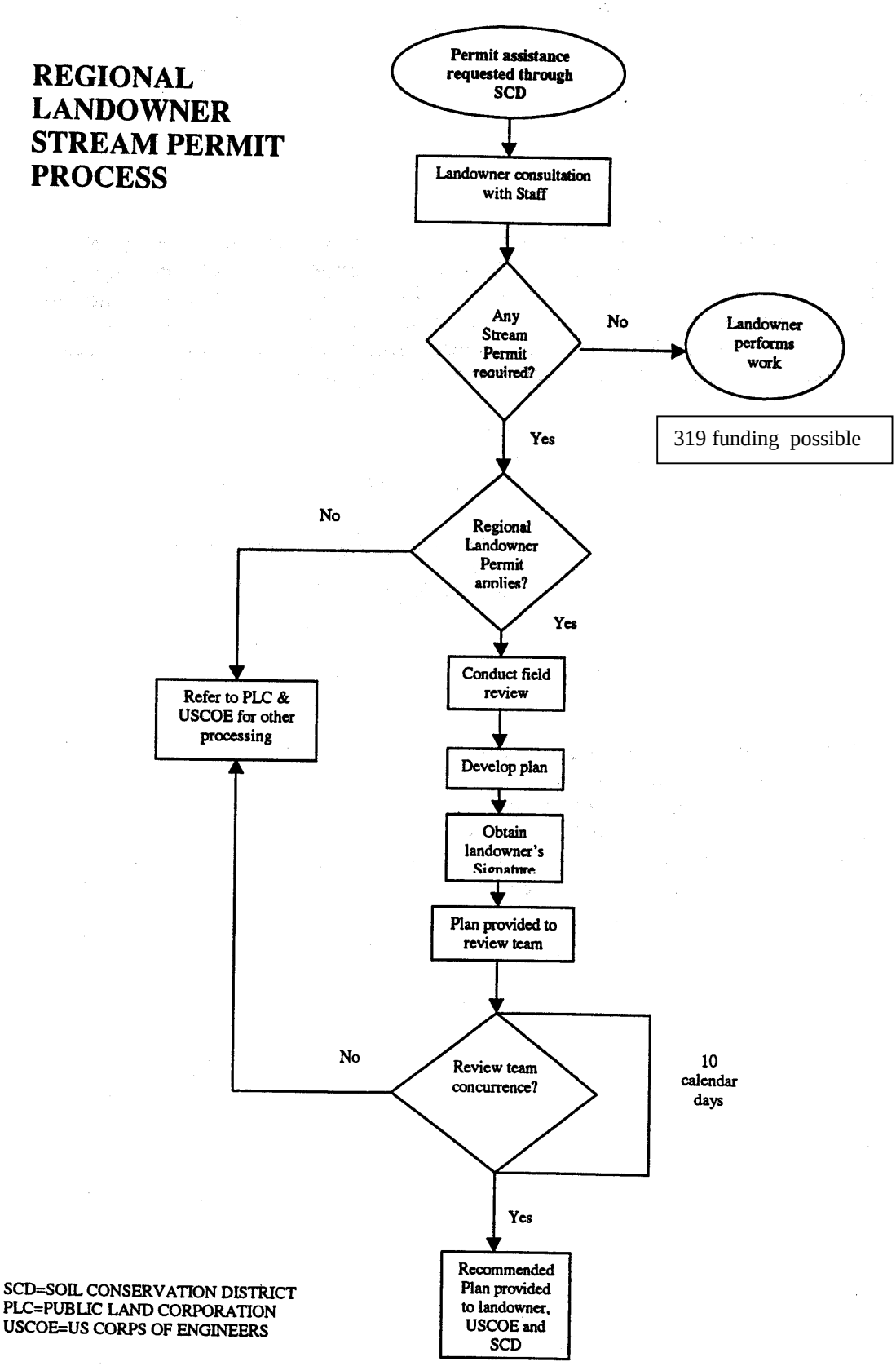
Goal 2 – 6: Identify streams in the priority watersheds, as designated by the Watershed Management Framework process, where stream bank erosion is causing water quality problems.

Objective 1: Incorporate stream bank stabilization needs as a part of watershed management plans for priority watersheds. 2001

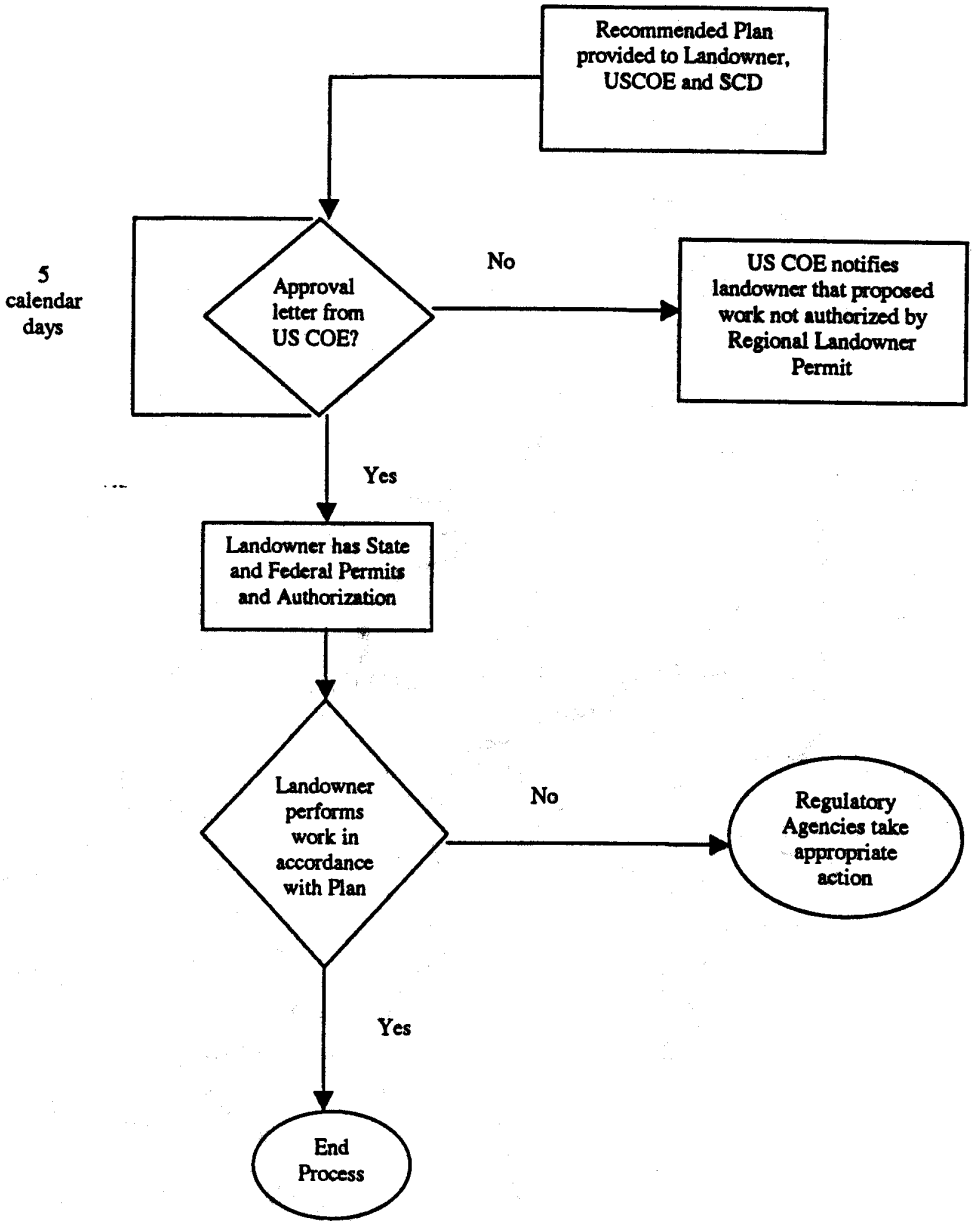
Objective 2: Inventory stream bank stabilization needs in all priority watersheds. 2010

Goal 2 – 7: Provide assistance through the Landowner Stream Access Program to stabilize stream banks in the priority watersheds.

Objective 1: Seek 319 funding to assist landowner stream bank stabilization projects in cooperation with SCD's in the priority watersheds.


REGIONAL LANDOWNER STREAM PERMIT PROCESS
Permit assistance requested through SCD
Landowner consultation with Staff
Any Stream Permit required?
No
Landowner performs work
319 funding possible
Yes
Regional Landowner Permit applies?
No
Yes
Refer to PLC & USCOE for other processing
Conduct field review
Develop plan
Obtain landowner's Signature
Plan provided to review team
Review team concurrence?
No
10 calendar days
Yes
Recommended Plan provided to landowner, USCOE and SCD
SCD=SOIL CONSERVATION DISTRICT
PLC=PUBLIC LAND CORPORATION
USCOE=US CORPS OF ENGINEERS

REGIONAL
LANDOWNER STREAM PERMIT PROCESS
(Continued)



VIII. WEST VIRGINIA NONPOINT SOURCE MANAGEMENT PLAN URBAN RUNOFF

Background:

The West Virginia Division of Environmental Protection - Office of Water Resources (WVDEP-OWR) stresses a source reduction and pollution prevention approach for stormwater quality management. This approach is based on the recognition that the quality of stormwater leaving an area is dependent on the levels of pollutants available for collection by runoff. Reducing source areas or concentrations reduces loadings. On a local level, this type of management program may include various components, such as sedimentation and erosion control programs for disturbed areas, land use planning and ordinance controls in developing areas, municipal programs for recycling and hazardous waste collection, public education and training programs, spill failure/containment programs, programs to detect and remove illicit connections where non-stormwater is introduced to stormwater flows and storm sewer systems, and educational programs. Such methods are considered the most efficient and effective from a cost and management standpoint. However, depending on the level of imperviousness and pollutants of concern, engineered stormwater control structures for stormwater management may also be needed.

Urban Nonpoint Source Contributions

With urban growth occurring throughout West Virginia, it can be expected that the contributions to water quality problems associated with urban areas will continue to increase. This heightens the need to develop effective urban stormwater management programs. Planning and design decisions that minimize pollution sources are some of the most effective measures for controlling urban stormwater runoff. The Non-point Source Program will continue to seek improvement in planning and design decisions and technology to meet this need.

The need exists for additional and better information on pollutant load reductions achievable by urban stormwater management programs and the most effective management measures for achieving these reductions. To meet this need the Non-point Source Program will continue to stress educating developers, contractors, government officials and the public to the benefits of proper stormwater management as a part of the construction component of the NPS Program. As part of the Watershed Management Framework, WVDEP-OWR is attempting to address these needs as funds become available and continue to seek funds from other resources.

Federal Stormwater Management Program

In 1987, Congress passed the Water Quality Act Amendments to the Clean Water Act requiring the U.S. Environmental Protection Agency (EPA) to develop regulations on permit application requirements for point source discharges of stormwater runoff associated with industrial activities and large and medium municipal separate storm

sewer systems (population greater than 100,000). These regulations became effective in December 1990 and required a large number of facilities throughout West Virginia to apply for and be covered by NPDES permits for stormwater discharge. The WVDEP-OWR has been delegated the authority to administer these regulations.

The goal of the stormwater discharge permitting in West Virginia is to prevent pollution of stormwater runoff to the degree possible by controlling source(s) of pollutants. Defining potential pollutant sources and establishing controls for the sources that will reduce and minimize pollutant availability will result in an improvement to the water quality of receiving streams, consistent with the overall goal of the water quality program. Accomplishing this objective requires a broad-based approach in developing stormwater management programs. The reasons for this approach are found in the nature of urban stormwater runoff. Stormwater runoff begins as a diffuse or nonpoint source of pollution. Unlike other nonpoint sources, stormwater runoff in urban settings is, to a high degree, directed to stormwater conveyance systems (storm sewers) and is ultimately discharge to surface waters as a point source that may be regulated under the NPDES stormwater program. Because of the large number of stormwater discharge points in an urban setting and the variability in stormwater flow, handling these discharges like conventional wastewater point sources, with end-of-pipe controls, is not appropriate. Instead, a broader approach is taken directed at management and control of the sources of pollutants. This approach provides flexibility for industries and municipalities to develop comprehensive, tailored stormwater programs.

Municipal permits

The NPDES municipal permitting requirements are designed to lead to the formation of site-specific stormwater management programs for a sewage treatment plant area. Industrial facilities discharging through a municipal separate storm sewer system are required to submit a permit application to the state and receive their own NPDES stormwater permit.

Industrial Permits

Industrial activities that require permitting are defined in eleven categories in the federal regulations, and range from sawmills and landfills to phosphate manufacturing plants and hazardous waste treatment, storage or disposal facilities. The regulations cover point source discharges that are related to manufacturing, processing, or material storage areas at an industrial facility. Stormwater discharges associated with industrial activities are cover by permits which require the development and implementation of site-specific stormwater pollution prevention plans and potentially contain technology based controls based on Best Available Technology (BAT)/Best Conventional Pollutant Control Technology (BCT) considerations or water quality control, if necessary. Through monitoring and regulating stormwater discharge quality, the goal of the NPDES stormwater program is to reduce the pollutant load in stormwater runoff.

Potential Permitting

The permitting requirements described here represent Phase I of the stormwater program. EPA and Congress are currently involved in studies to determine the scope of additional stormwater coverage under Phase II of the stormwater program. In addition, reauthorization of the Clean Water Act will most likely include new stormwater management provisions. Further stormwater NPDES coverage could encompass additional industrial activities or additional, smaller municipal areas. If such areas of coverage are added, WVDEP-OWR will be responsible for the appropriate permitting of these areas within West Virginia. In addition, the State can require individual industries or municipalities to obtain NPDES stormwater permits where their stormwater discharge is contributing to a water quality violation or contributing significant pollutants to surface waters.

State Stormwater Management Program

In addition to the federal stormwater management programs mentioned above, two counties and one municipality in the State also administers stormwater programs that apply to development activities that may impact the waters of the state. While the specific requirements may vary within the different stormwater program areas, they are all based on similar principals and strategies for stormwater control. At the present, the State of West Virginia regulatory agencies have no stormwater management programs in place, but this will change in the near future, with the concern from the public on stormwater issues. Education and demonstration on stormwater best management practices will facilitate this change.

Goal 2 – 8: Assess the impact of urban runoff in the state's watersheds by 2005.

Objective 1: Evaluate the data from the Watershed Assessment Program's monitoring to identify urban runoff problems. 2005

Objective 2: Identify those priority watersheds as designated in the Watershed Management Framework process with urban runoff problems. 2005

Goal 2 – 9: Develop an urban runoff program by 2005.

Objective 2: Seek additional funding for the development of an urban runoff program. 2002

Objective 2: Develop an educational effort to educate developers and civic officials to the need, design and implementation of urban BMP's. 2005

Chapter 3 - Agriculture

I. OVERALL GOAL

The WV Agriculture NPS program is an effort to prevent or reduce NPS impacts on surface and groundwater through education and technical assistance to landowners, local governments, youth, watershed associations, and the general public to build and maintain a sustainable agriculture industry.

The agriculture NPS program will work cooperatively through the Conservation Partnership, consisting of the Natural Resources Conservation Service, the WV Soil Conservation Agency, and the state's 14 Soil Conservation Districts, as well as through the WV Watershed Management Framework to identify priority watersheds for protection and improvement. The agriculture program will also continue its statewide approach for education and technical assistance on agriculture BMPs.

II. BACKGROUND

West Virginia has 20,000 farms statewide on 3.7 million acres of land. Gross farm income totals $502.9 million.

The top agriculture industry in West Virginia is poultry production. The combined value of production from eggs, broilers, turkeys and chickens was $208.8 million in 1996. The estimated number of poultry is 91.5 million head.

Sheep and lamb inventory is estimated at 55,000 head with a value of production which totals $4.7 million. Hog and pig inventory was 19,000 with a value of production at $1.8 million. Total cattle equals 450,000 head with a production value of $184.5 million and the average number of dairy cows in West Virginia was 19,000 head producing 252 million pounds of milk with a value of $38.3 million.

Field crop production for 1996 includes hay at 1,066,000 with a production value of $70.9 million; corn for grain at 4.2 million bushels with a production value of $13.8 million, corn for silage and forage at 320,000 tons, wheat at 495,000 bushels with a value of $2.1 million, oats at 150,000 bushels with a value of $368,000, and tobacco 2 million pounds with a value of production of $3.9 million. The 1996 apple crop consisted of 105 million pounds with a value of production of $11.2 million. The 1996 peach production was 16 million pounds with a value of production of $5.7 million.

Aquaculture in West Virginia is a growing industry. The discharge of water into receiving streams is regulated through the NPDES permit process, however, the solids that remain in settling basins or that are collected in vacuum systems must be land applied or otherwise responsibly managed. To date, most aquaculture operations in West Virginia are relatively small and do not meet the minimum criteria for a NPDES permit.

It is anticipated however, that significant growth will occur in the industry due to the use of abandoned mine water and other unique opportunities available and promoted by the WV Department of Agriculture.

Of the 20,000 farms statewide, approximately 13,000 are currently Soil Conservation District cooperators, or 65 % of the total. District cooperators are required to have a conservation plan.

The Conservation Partnership, including WVSCA, NRCS, the 14 Soil Conservation Districts, is taking the lead role in developing Watershed Restoration Action Strategies (WRAS) and Incremental 319 project proposals for priority watersheds identified by the WV Watershed Management Framework. This process includes working with local stakeholders within the watersheds to be able to implement a holistic watershed approach. This approach will result in the greatest number of people and agencies participating in the process as well as in the implementation of strategies.

The Soil Conservation Districts, as local subdivisions of state government, have historically worked closely with local agency personnel, such as the Division of Forestry, WV DEP, Cooperative Extension Service, USDA Resource Conservation and Development Councils, Solid Waste Authorities, Health Departments, and others to implement projects and programs. In addition, as elected representatives, they are responsive and open to the input from the individuals who live and work within their watersheds. The public is invited to participate in the development of District annual plans of work, EQIP priority area identification, and WRAS development and implementation.

The Watershed Resource Center (formerly the NPS Resource Management Training Center) will be working closely with the Framework to increase educational outreach related to Framework activities and priority areas, as well as to provide education and training within identified priority watersheds for which WRASs are developed.

Through the WV Watershed Management Framework, and other close working relationships with WVDEP, the agriculture community and responsible agencies are assisting in the implementation of BMPs in TMDL watersheds in the Potomac through the PL – 534, the North Fork South Branch Incremental 319 watershed projects and the Agriculture Water Quality Loan Program. In addition, the agriculture community, including WV Department of Agriculture is providing monitoring assistance to evaluate fecal coliform reductions in the Potomac and to assist in identifying sediment sources within the Little Kanawha.

Animal feeding operations (AFOs) are being addressed through PL – 534, 319 Incremental, EQIP and the Agriculture Water Quality Loan Program. USDA NRCS is also pursuing additional technical assistance dollars to be able to develop Comprehensive Nutrient Management Plans (CNMPs) on the approximately 10,000 AFOs located in West Virginina. The Agriculture Water Quality Position Paper outlines the roles of each

agency in the identification of potential problem AFOs and WV's approach to provide for BMP implementation to improve those AFOs.

The WVSCA has integrated its base 319 program with the incremental 319 program, by tying both federal and state funded NPS and watershed employees to implement incremental 319 watershed projects. While continuing a statewide approach, again through state and federally funded personnel, to address ongoing day to day NPS issues, the Conservation Partnership has been working closely with the Framework to identify and pursue improvements in priority watersheds.

While West Virginia remains predominantly rural, development pressures exist in the eastern panhandle, the north central, and west central areas of the state. In these areas, farmland is rapidly being developed into sprawling suburban centers.

III. ENVIRONMENTAL IMPLICATIONS

In the Potomac Valley, increases in the production of poultry, combined with the significant recreational value of the area, has led to conflicts between environmentalists, recreational users, and the landowners/farmers of the area over concerns of bacteria contaminated recreational waters. Although there has been evidence at times of increased levels of bacteria in the watersheds of the Potomac Valley, to date, these increases have not been tied to any specific land use.

Current poultry litter production in the Potomac Valley Soil Conservation District is estimated at 145,000 tons annually. There are approximately 870 poultry houses in the watershed. Adequate litter storage facilities exist for only about 25% of the 344 individual poultry operations in the District. Improperly stored litter greatly increases the potential for surface and groundwater contamination from nutrients and bacteria. In addition, with the number of poultry producers in the Potomac Valley and the steep terrain, land available for the application of litter is limited. Inappropriate timing of land application, such as when land is frozen or saturated, can also lead to surface and groundwater impacts.

The potential for phosphorus builds up in soils where poultry litter is continuously spread, has become a significant issue. Soil sampling in the area shows, however, that only a little more than 20% of the soil analyses indicated phosphorus levels in excessive concentrations. In addition, these sites existed on individual fields and farms, not in broader, more general areas. In response to this evidence, West Virginia has adopted a newly developed Phosphorus Index as a standard management tool for the state.

Across the state, the lack of waste management systems including manure storage facilities and nutrient management planning, improperly located livestock confinement areas and the lack of riparian buffers have the potential to lead to significant runoff of animal wastes. Many livestock confinement areas are located adjacent to intermittent and perennial streams resulting in direct run-off of manure nutrients and pathogens into surface waters.

Severely eroding pasture and grasslands contribute high degrees of sediment to surface waters throughout West Virginia. WV has a total of 1,608,900 acres of pasture, of which 1.3 million need conservation treatment. An estimate of 10,134,000 tons of topsoil per year is eroding off WV's pasture lands. The areas of greatest erosion include the Little Kanawha, West Fork, and the Western Soil Conservation Districts. In addition to the loss of topsoil, pastured livestock with unrestricted access to perennial streams can contribute to stream bank instability, nutrient and bacteria loading, loss of fish and wildlife habitat, and degradation of natural riparian buffers.

In general, water quality problems associated with pesticide and chemical fertilizer use in West Virginia are uncommon, however, some instances of groundwater/well water contamination have occurred. Certain areas of the state are more vulnerable to groundwater contamination from pesticides and fertilizers due to soils, geology, hydrology, and pesticide and fertilizer use patterns. Inappropriate rate or timing of application, lack of secondary containment at pesticide and fertilizer storage and mixing/loading sites, lack of containment at bulk pesticide and fertilizer storage sites and rainwater and surface discharge management at storage and mixing sites can all lead to ground and surface water impacts.

Biosolids are the residue of materials removed from municipal wastewater, formerly called sewage sludge, during the process of wastewater treatment. Biosolids contain almost every conceivable element or compound found in wastes from human, domestic, commercial and industrial sources. Research has shown that it may contain substantial quantities of organic matter, plant nutrients, trace elements and some potentially hazardous compounds. Domestic septage is any liquid or solid material removed from a septic tank, cesspool, or portable toilet. Land application of biosolids and domestic septage has become one method of reusing this substance to provide better soil tilth, aggregate stability, aeration, water holding capacity, deeper root penetration, and drought tolerance on agriculture lands. Without strict control and monitoring of the amounts of metals and nutrients in the sludge and soil, the rates of land application, and storage procedures, land application of biosolids and domestic septage can result in off-site impacts and non point source pollution.

IV. EXISTING PROGRAMS

West Virginia has initiated numerous watershed based, regional and statewide programs to address the many potential and existing agriculture non point source threats to surface and groundwater. West Virginia’s 14 Soil Conservation Districts are an integral part of the planning and delivery for these programs as well as the WV Soil Conservation Agency, WV Department of Agriculture, WVU Cooperative Extension Service, US Department of Agriculture, and WVU College of Agriculture and Forestry. The WV Watershed Management Framework is the mechanism used to identify priority watersheds for targeted activities.

Watershed Management Approach

A new approach to identifying and solving nonpoint sources of pollution in West Virginia is the implementation of the integrated watershed management approach. This approach, led by WV DEP with the participation of all stakeholder agencies, will incorporate public notification and participation, monitoring and assessment of all 32 hydrologic regions, identification and comprehensive monitoring of subwatersheds with pollution problems or in need of protection and finally the development and implementation of a watershed management plan to restore or protect the watershed. This approach will finally allow for an integrated and holistic approach to watershed management in West Virginia.

This program will be used to identify waters and their watersheds impaired by nonpoint source pollution and identify important unimpaired watersheds that are threatened or otherwise at risk. Further, this program will provide for a process to progressively address these identified waters by conducting more detailed watershed assessments, developing watershed implementation plans, and then by implementing the plans.

The specific role of the management agencies and agriculture NPS is identified on pp. of this plan.

Goal 3 – 1: Provide support to and coordination with WV Watershed Management Framework to identify, prioritize, and implement watershed projects – 2000 – 2005.

Objective 1: Participate in interagency steering committee to determine priority watersheds – 2000 - 2005.

Objective 2: Work through SCDs to collect and summarize data regarding agriculture activities – 2000 - 2005.

Objective 3: Work with and through the SCDs and local watershed groups to develop and implement Watershed Restoration Action Strategies (WRAS) – 2000 - 2005.

Objective 4: Develop agriculture water quality management objectives and options for watershed management plans – 2000 - 2005.

Objective 5: Determine and document the most effective best management practices and/or management options – 2000 - 2005.

Objective 6: Provide BMP technical assistance to agriculture producers in identified priority watersheds – 2000 - 2005.

Objective 7: Monitor progress of the agricultural portion of the watershed management plans – 2000 - 2005.

Support of Watershed Associations

General support to establish and developing watershed associations will be provided throughout the state. This support will include but is not limited to meeting planning and assistance, technical assistance, financial assistance and additional resource identification. This support also consists of participation in the West Virginia Watershed Network. The WV Watershed Network is an ad hoc committee established to provide needed support to watershed associations in West Virginia. The Network is also designed to provide for interagency coordination and avoid duplication of effort by the numerous state, nonprofit, and private entities assisting in watershed management.

Support to watershed associations also consists of participation in the WV Stream Partners Program. This program provides mini-grants up to $5000 to watershed associations for watershed improvement projects. Assistance includes help in developing grant proposals and assistance in carrying out improvement projects.

Goal 3 – 2: Provide support and guidance to local watershed associations with agricultural nonpoint source issues – 2000 - 2005.

Objective 1: Conduct a continuous assessment to determine where assistance is necessary – 2000 - 2005.

Objective 2: Assist in the development of local watershed plans – 2000 - 2005.

Objective 3: Coordinate with USDA, DEP, DNR, the WV Watershed Network and others to provide resources to local watershed groups – 2000 - 2005.

Objective 4: Support WV Stream Partners Program – 2000 - 2005.

Erosion and Sediment Control

Technical assistance in the form of conservation planning for the agriculture community identifies and promotes the use of best management practices to control erosion from cropland, pasture land and other land. Federal programs through USDA are used to provide cost-share incentives for erosion related agriculture best management practices.

Goal 3 – 3: Reduce impacts to surface waters in West Virginia from soil erosion on agricultural lands with a focus on priority watersheds identified through the Watershed Management Framework to achieve compliance with water quality standards by 2010.

Objective 1: Review and provide technical assistance for sediment control plan development for agricultural land disturbances – 2000 – 2010.

Objective 2: Implement the approved Conservation Reserve Enhancement Program to sign up 3500 stream miles – 2010.

Objective 3: Work with farmers to establish 100 miles of riparian areas or buffers to save soil and to reduce nitrogen and phosphorus loading by an estimated 63% and 70% respectively - 2010.

Objective 4: Study and expand the use of bioengineering techniques to stabilize stream banks - 2003.

Objective 5: Work with USDA, US Fish and Wildlife Service, WV Department of Natural Resources and WV Division of Forestry to establish riparian areas or buffers on agricultural lands - 2005.

Objective 6: Develop 100 stream management plans for landowners in accordance with the WV Stream Access Permit for Landowners Program - 2005.

Nutrient and Fertilizer Management

Nutrient management plans are developed, implemented and updated as needed to meet several objectives of the WV Nonpoint Source program for agriculture. These objectives include 1) proper storage, collection and/or composting of poultry and livestock wastes 2) proper application rates and timing based on environmental conditions and crop needs 3) proper use of commercial fertilizers 4) reduction of soil erosion, 5) improved infiltration through improved tilth, aeration and water holding capacity of soils where manure are applied, and 6) export of surplus litter or manure to other farms or watersheds.

Nutrient management plans consider and account for all possible sources of on-farm nutrients as well as off-farm organic material such as chemical fertilizers and biosolids. Nutrient management plans also incorporate the use of the Pre-sidress Nitrogen Quick Test program to eliminate the misapplication of nitrogen fertilizers on cropland.

The redistribution of poultry litter and livestock manure is a high priority in the nutrient management program. When manure produced on a particular farm exceed the amount needed for crops and pasture, a method of storage and distribution is necessary to provide for the movement of that manure off the farm.

Fertilizer Management regulations in West Virginia are implemented and enforced by the WV Department of Agriculture. These rules include:

61CSR6 Sale and Distribution of Commercial Fertilizer

61CSR6B Primary and Secondary Containment of Fertilizers.

The WVDA also implements “The General Groundwater Protection Rules for Fertilizer and Manure” which requires that persons with more than 1000 animal units, (300 in karst limestone areas) submit a nutrient management plan, and ‘Best Management Practices for Fertilizers and Manure” a voluntary procedural rule that

guides the land application of fertilizers and manure to reduce the risk of groundwater contamination.

In addition, WVSCA NPS staff as well as CES and USDA actively work with agriculture producers to limit their use of fertilizers by accounting for animal waste, biosolids, and other potential on-farm nutrients through nutrient management planning. WVSCA will emphasize nutrient and animal waste management to reduce NPS impacts to surface and ground water, with a focus on priority watersheds identified through the Watershed Management Framework.

Goal 3 – 4: Develop and implement nutrient management plans with agriculture producers to manage 580,000 lbs of nitrogen and 420,000 lbs of phosphorus per year.

Objective 1: Write or update 120 nutrient management plans in cooperation with USDA, WSCA and CES - annually.

Objective 2: Provide technical assistance and follow up to farmers to ensure proper implementation of nutrient management plans such as appropriate timing and application rates of animal wastes, biosolids and chemical fertilizers – 2000 - 2005.

Objective 3: Work with poultry integrators, growers and others to encourage marketing and distribution of 12,000 tons of poultry litter per year outside the Potomac Valley – 2005.

Goal 3 – 5: Reduce reliance on government for implementation of the presidress nitrogen testing program (PSNT) to free up professional staff time to allow for broader education and technical assistance.

Objective 1: Train farmers on importance of accurate soil sampling - 2000.

Objective 2: Train farmers on use of PSNT equipment – 2000.

Objective 3: Provide supplies through transition period – 2001.

Objective 4: Investigate other nutrient management technologies - 2003.

Objective 5: Transfer information on new technologies to farm community - 2003.

Objective 6: Investigate possibilities for use of volunteers or privatization of fee for service program through CES or farm cooperatives – 2000 - 2005.

Goal 3 – 6: Work with the agriculture community on the installation of agriculture best management practices with a focus on priority watersheds identified through Watershed Management Framework, TMDLs, etc – 2000 - 2005.

Objective 1: Stabilize and/or relocate 500 livestock feeding areas to reduce / manage 201,667 lbs of nitrogen and 145,833 lbs of phosphorus annually - 2003.

Objective 2: Identify and implement agriculture BMPs as needed – 2000 - 2005.

Objective 3: Work with DEP referral program for assistance to violators through system identified in the WV Agriculture Position Paper – 2000 - 2005.

Objective 4: Work with farmers to encourage and provide technical assistance on composting of 16,000 tons of animal wastes. – 2000 – 2005

Objective 5: Utilize litter composting demonstration project in Potomac Valley to continue educational efforts – 2000 – 2005.

Objective 6: Develop and implement litter composting demonstrations in Eastern Panhandle and Greenbrier Valley Soil Conservation Districts - 2005.

Objective 7: Develop and implement other composting demonstrations with beef and / or horse manure - 2005.

Goal 3 – 7: Obtain a better understanding of the movement or transport of phosphorus through the soil to establish appropriate best management practices by 2005.

Objective 1: Calibrate phosphorus index - 2003.

Objective 2: Evaluate the success of the use of the phosphorus index and associated BMPs - 2005.

Goal 3 – 8: Evaluate status of Animal Feeding Operations (AFOs) in West Virginia

Objective 1: Develop nutrient management plans and provide technical assistance to 10,900 livestock operations / potential AFOs - 2009.

Objective 2: Work with DEP, WVDA, NRCS, WVSCA, and farmers with the potential for causing NPS impacts from animal feeding operations on establishment of BMPs – 2000 - 2005.

Objective 3: Identify potential sources of funding for implementing AFO BMPs through SRF, EQIP, etc – 2000 - 2005.

Goal 3 – 9: Coordinate with WVDA, WVSCA, USDA, CES, WV Department of Health and Human Resources and others to establish waste management guidelines for aquaculture.

Objective 1: Develop standards and specifications for waste management – 2002.

Objective 2: Publish and distribute educational and technical materials on aquaculture waste management - 2003.

Objective 3: Develop nutrient management plans for land application of by-products – 2000 - 2005.

Pesticide Management

Pesticide regulations in WV are implemented and enforced by the WV Department of Agriculture. These rules fall under Article 16A WV Pesticide Control Act of 1990 and include:

61CSR12A Certified Pesticide Applicator Rules
61CSR12D Regulations Governing the Aerial Application of Herbicides to Rights of Way
61CSR12G General Groundwater Rules for Pesticides
61CSR12H Bulk Pesticide Operational Rules
61CSR12I Non-Bulk Pesticide Rules for Permanent Operational Areas
61CSR22 Generic State Management Plan for Pesticides and Fertilizers in Groundwater
61CSR22A Best Management Practices at Temporary Operational Areas for Non Bulk Pesticide Mixing and Loading Locations

In addition to these rules the WVSCA, USDA and CES have developed a program for on-farm assistance for the proper storage and management of pesticides and a program to reduce the unnecessary use of pesticides through Integrated Pesticide Management or IPM. IPM involves scouting crops after planting to identify weeds and insects to prevent unnecessary or broad spectrum spraying of chemical pesticides.

Construction of pesticide mixing/loading pads is cost-sharable through UDSA. It is anticipated that numerous pads will be constructed across the state over the next several years.

In 1995, the WVSCA funded and coordinated a pesticide collection program for farmers in 4 counties of the Eastern Panhandle and Potomac Valley Soil Conservation Districts with the help of the WV Department of Agriculture, US Department of Agriculture and WVU Cooperative Extension Service. The Eastern Panhandle of West Virginia utilizes the most significant and dangerous pesticides due to the orchards and fruit grown. This program netted more than 30 tons of unwanted and outdated pesticides during a 3-day collection period. This program will be continued in for the remaining 4 counties of the area. In 1997, the WVDA conducted a pesticide collection in the western counties of the state and collected and properly disposed of 16,000 pounds of outdated or unusable pesticides. A statewide pesticide disposal task force is investigating the possibility of providing a program in other priority areas throughout West Virginia.

The WV Department of Agriculture operates a pesticide container collection and disposal program. In 1995, approximately 450 containers were collected, 1996, 5000

containers, and in 1997, 10,000 containers were collected, chipped, and properly disposed.

The WV Department of Agriculture has also conducted extensive groundwater monitoring in areas where groundwater might have a high potential for contamination from pesticides. This monitoring has led to the development of an extensive database of information that details groundwater quality in West Virginia.

Goal 3 – 10: Manage pesticides on 5000 acres to protect surface and ground water by 2005**.**

Objective 1: Work with farmers and non-farmers to reduce unnecessary use of pesticides through ICM/IPM program – 2000 - 2005.

Objective 2: Develop an educational program for non-certified applicators of pesticides on pesticide application best management practices - 2001.

Objective 3: Conduct 5 workshops for non-certified applicators with an emphasis on identified priority watersheds - 2005.

Objective 4: Coordinate with statewide pesticide disposal committee to dispose of outdated and unused pesticides – 2000 - 2005.

Goal 3 – 11: Implement pesticide container disposal program coordinated by WV Department of Agriculture.

Objective 1: Hold 5 pesticide container collection days annually – 2000 - 2005.

Objective 2: Collect 10,000 pesticide containers annually 2000 - 2005.

Objective 3 Encourage the use of bags for pesticide use – 2000 - 2003.

Objective 4: Work with WV Department of Agriculture and USDA to install pesticide mixing pads / containment facilities where needed – 2000 - 2002.

Objective 5: Educate farmers and homeowners on the proper storage of pesticides – 2000 - 2005

Mid Atlantic Certified Crop Advisor Program

WV Nonpoint Source staff from WV Soil Conservation Agency, USDA, and WVU Cooperative Extension Service participate in the Mid Atlantic Certified Crop Advisor (CCA) Program. This program certifies professionals in nutrient management, integrated pest management and crop production to ensure that resource managers providing council to farmers have a good understanding of science, food safety, technology, economics and environment.

The program has established standards of knowledge, experience, ethical conduct and continuing education; enhances professionalism; and promotes dialogue among those involved with agriculture and natural resource management. WV currently has 19 agriculture specialists with nutrient management certification through Mid Atlantic CCA.

Goal 3 – 12: Develop professional and credible field staff – 2000 - 2005**.**

Objective 1: Participate in Mid Atlantic Certified Crop Advisor Program – 2000 - 2005.

Objective 2: Provide necessary training to increase understanding of NPS issues and agriculture best management practices – 2000 - 2005.

Objective 3: Provide training and development in new technologies and strategies to address NPS pollution – 2000 - 2005.

Objective 4: Institutionalize summer intern program for the purpose of education and potential future staff resources – 2000 - 2005.

Grasslands Management

WV has initiated a grasslands management program to address severely eroding pasture lands that includes increasing education and public awareness of the benefits of improved vegetative cover, accelerated technical assistance, and demonstration projects. This program is a cooperative effort of USDA, WVU Extension Service, WV Soil Conservation Agency, WV Soil Conservation Districts, WVU College of Agriculture and Forestry, WV Department of Agriculture, WV Farm Bureau, WV Cattlemen's Association, and the WV Shepherd's association. WV's grasslands program is provided guidance and direction through the WV State Grazing Lands Steering Committee made up of representatives from the above listed governmental and nongovernmental organizations.

WV's grasslands program to date has provided funding for 14 grassland demonstration project farms (1 per Soil Conservation District). Proposals were solicited from the SCDs and decisions for funding were based on magnitude of erosion within the District, degree of cooperation and financial contributions from other groups, agencies and interested parties, and the use of innovative products or practices.

Forage analysis will be another significant component of the program designed to show the landowner the economic value of improving their grassland management. By improving forage quality, the landowner should see an improvement in livestock health, increased production, increased economic return, and a decrease in soil erosion.

USDA cost-share programs are available to address problems associated with grassland management, depending upon funding.

The focus of the grassland program will be to reduce impacts to surface waters in West Virginia from bacteria, nutrients, and soil erosion on agricultural lands with an emphasis on priority watersheds identified through the Watershed Management Framework.

Goal 3 – 13: Manage 3,000,000 lbs of nitrogen, 6,000,000 lbs of phoshorus and save 200,000 tons of soil through the statewide grassland management program by 2005.

Objective 1: Educate 50 farmers annually on the importance and means for grassland management to reduce erosion by conducting 2 Forage Livestock Schools, 14 Grassland Field Days and 10 Pasture Walks – 2000 - 2005.

Objective 2: Develop 300 grassland plans per year to manage bacteria, nutrients and soil erosion through USDA, WVSCA, and CES – 2000 - 2005.

Objective 3: Provide accelerated technical assistance to farms on grassland management with a focus on identified priority watersheds – 2000 - 2005.

Objective 4: Conduct forage analysis on 75 farms and fecal sampling on 6 farms to increase vegetation and decrease soil erosion by showing the economic benefits of improved grazing management - 2003.

Objective 5: Publish and distribute information on forage sampling and fecal analysis – 2003.

Objective 6: Maintain and utilize 14 demonstration farms - 2005.

Objective 7: Establish and maintain a record keeping system for grassland demonstration farms in order to evaluate parameters of success - 2005.

Objective 8: Distribute record keeping information to other grassland farmers in WV – 2005.

Objective 9: Investigate and promote pasture conversion / agroforestry on lands not suitable for grazing – 2000 - 2005.

Objective 10: Work with USDA, CES and others to develop case studies on grassland demonstration farms – 2000 - 2005.

Objective 11: Continue work with multi-agency and private sector, Grazing Lands Steering Committee – 2000 - 2005.

Objective 12: Cooperate in development of Best Management Practices fact sheets including watering systems, forage analysis, grasslands management, and fencing - 2002.

WV Watersafe

WV Watersafe is West Virginia's equivalent and adaptation of Cooperative Extension Service's Farm/Home * A * Syst programs. This program is a cooperative effort of WV Soil Conservation Agency, WV Farm Bureau, USDA Natural Resources Conservation Service, WVU Extension Service, and the Rural Community Assistance Program designed to help landowners assess, determine risks, and identify solutions to groundwater contamination problems on their property.

Goal 3 – 14: - Conduct 55 (1 per county) presentations of WV Watersafe Program by 2005**.**

WV Agriculture Water Quality Loan Program

The WV Agriculture Water Quality Loan Program is a joint effort between U.S. EPA, WV Division of Environmental Protection, WV Soil Conservation Agency, the WV Soil Conservation Districts, USDA Natural Resources Conservation Service and local banks to utilize the State Revolving Loan Fund for low interest loans to implement agriculture water quality best management practices. Individuals who wish to participate in the loan program must obtain or update their conservation plan to incorporate any necessary practices to protect water quality, receive endorsement from the SCD for that plan, then take their "Certificate of Qualification" and apply at cooperating banks.

The program has been operating successfully in the Potomac Valley Soil Conservation District to address water quality problems associated with livestock and poultry production. Statewide implementation has occurred and is tied to the USDA Environmental Quality Incentive Program and 319 Incremental Watershed Project areas.

Goal 3 – 15: Use the Agriculture Water Quality Loan Program (AgWQLP) in priority watersheds (including TMDL watersheds) in West Virginia to encourage implementation of needed best management practices – 2000 - 2005**.**

Objective 1: Coordinate loan program with USDA Environmental Quality Incentive Program, 319 Incremental Watershed projects, and other cost share programs – 2000 - 2005.

Objective 2: Monitor the program yearly to incorporate needs, practices, etc. to improve and protect water quality – 2000 - 2005.

Objective 3: Investigate the use of the Safe Drinking Water Act Revolving Loan Fund to implement agriculture water quality best management practices in source and wellhead protection areas - 2004.

Biosolids Management Program

The WV Soil Conservation Agency in cooperation with WV Division of Environmental Protection and WVU Cooperative Extension Service will oversee the program for land application of biosolids on agricultural land. The WVSCA and CES will conduct site evaluations and develop and follow up on nutrient management plans. Coordination with DEP will provide for an increase in storage capability for biosolids at waste treatment plants, a better understanding / analysis of the impact of metals on soils, and improved spreading techniques used by waste treatment plants on agricultural land. DEP will continue the regulatory and enforcement components of the biosolids program.

Goal 3 – 16: Plan for nutrient and animal waste to reduce NPS impacts to surface and ground water by managing 65,000 lbs of nitrogen, 45,000 lbs of phosphorus and reduce soil erosion by 6500 tons, with a focus on priority watersheds identified through the Watershed Management Framework by 2005.

Objective 1: Work with agriculture operations over a five year schedule as outlined by the WV watershed groupings established by the WV Watershed Management Framework to ensure appropriate and environmentally sound land application of biosolids – 2000 - 2005.

Objective 2: Train field staff in status of regulatory program and WVSCA, CES and DEP responsibilities for the biosolids program - 2000.

Objective 3: Coordinate development of 50 nutrient management plans annually with regulatory requirements for trace elements, pathogens, etc. on agriculture operations land applying biosolids – 2000 - 2005.

Objective 4: Conduct 50 land application site evaluations for site approval prior to land application – 2005.

Objective 5: Train farmers on biosolids program and related best management practices – 2000 - 2005.

Objective 6: Conduct Nutrient Management Plan follow up on 100 plans – 2005.

Objective 7: Work with farmers on correct spreader calibration – 2000 - 2005.

Objective 8: Provide assistance to WTPs to conduct soil testing with metal analysis – 2000 – 2005.

Objective 9: Research the long-range effects of biosolids application - 2005.

Objective 10: Research background metals in several WV soil types - 2001.

Objective 11: Implement use of GIS/GPS to track land application sites – 2000 – 2005.

Potomac Headwaters Water Quality Project

The Potomac Headwaters Water Quality Project is an effort by WV Soil Conservation Agency, WV Cooperative Extension Service, USDA Natural Resources Conservation Service, Farm Service Agency, and Rural Development, WV Department of Agriculture, WV University College of Agriculture and Forestry, Eastern Panhandle and Potomac Valley Soil Conservation Districts, and the Potomac Headwaters Poultry Water Quality Advisory Committee to provide for accelerated federal, state and local educational, technical and financial assistance to reduce and prevent water quality impairments.

As of December 31, 1996 the WVSCA NPS program has provided nearly $500,000 for a wide variety of Nonpoint Source Demonstration Projects. A Potomac Interagency Water Quality Office has been established which houses individuals from WVSCA, USDA, WVDA, and WVU CES to provide additional assistance and guidance to farmers, local governments and others in the Potomac Valley. A litter composting demonstration has been established which educates farmers and other groups on on-farm methods and options for composting poultry litter to create a marketable end product. A 1-800 litter hotline has also been established at the Potomac Interagency Water Quality Office to link buyers and sellers of litter for land application statewide. To date this hotline has moved over 4500 tons of litter out of the Potomac Valley watershed to areas as far north as Monongalia County, east to Berkeley County and west to Putnam County, West Virginia, and into Virginia, North Carolina and Ohio.

In addition, USDA and WVSCA have provided for a land treatment project of $12,000,000 in technical assistance and cost share for the installation of dead bird composters, waste management systems, relocation of confined livestock areas, and filter strips. WVSCA in cooperation with WV Division of Environmental Protection have also implemented the Agriculture Water Quality Loan Program to complement the land treatment project in the Potomac Valley. Implementation of the program will occur by priority watershed over a 3-year period. Long term contracts with farmers for maintenance and proper use of the practices will be established for 10 years.

Goal 3 – 17: Improve and protect surface and groundwater in the South Branch, Potomac by managing 134,000 tons of animal waste consisting of 11,691,200 lbs of nitrogen and 8,170,400 tons of phosphorus by 2005.

Objective 1: Maintain Potomac Interagency Water Quality Office – 2000 – 2005.

Objective 2: Maintain litter composting demonstration and identification of alternative uses and to remove 12,000 tons of litter from the watershed – 2000 - 2005.

Objective 3: Develop and monitor 400 nutrient management plans on 40,400 acres to manage 114,800 tons of poultry litter and 19,200 tons of beef manure - 2005.

Objective 4: Install 250 litter storage sheds to manage 114,800 tons of litter consisting of 11,480,000 lbs of nitrogen and 8,036,000 lbs of phosphorus - 2003.

Objective 5: Install 250 dead bird composters -2003.

Objective 6: Improve 100 livestock feeding areas to manage 211,200 lbs of nitrogen and 134,400 lbs of phosphorus -2003.

Objective 7: Establish 50 miles of riparian or buffer areas to save 5,400,000 tons of soil and reduce nitrogen and phosphorus by 63 % and 70% respectively - 2005.

Objective 8: Manage 1-800 litter hotline to facilitate the movement of 12,000 tons of litter between sellers with excess amounts and buyers outside the watershed – 2000 - 2005.

Objective 9: Participate in WV Poultry Festival through displays, presentations, etc. Enforce the WVDA Dead Bird Disposal Regulations, Title 61CSR1C for the poultry industry – 2000 - 2005.

Objective 10: Assess and evaluate the watershed to establish work elements and effectiveness of program – 2000 - 2005.

WV Department of Agriculture Nutrient Management and Water Quality Laboratory

A laboratory was opened in Moorefield, WV by the WV Department of Agriculture in 1994 to assist producers with their nutrient management planning. This lab provides free analysis of manure and poultry litter so that producers can accurately apply the amount of manure necessary for plant needs. Litter and manure analyses also aid in the redistribution of manure as exchanges between individuals can be made based on nutritive value.

This laboratory is also certified to conduct water analyses. A cooperative effort between numerous agencies, led by the WV Department of Agriculture, will continue to sample and monitor the water quality of the Potomac Valley and other priority / TMDL watersheds.

Goal 3 – 18: Coordinate efforts between agencies through WVDA Laboratory facilities – 2000 - 2005**.**

Objective 1: Monitor water quality in cooperation with WVSCA, WVDA, WV DEP and other public and private groups to establish success of BMP installation and water quality conditions – 2000 – 2005.

Objective 2: Conduct manure and litter analysis for nutrient management plan development and implementation – 2000 - 2005.

USDA Programs

Environmental Quality Incentive Program - The program was established in the 1996 Farm Bill to provide a voluntary conservation program for farmers that face serious threats to soil, water and related natural resources. In West Virginia, over 85% of technical, financial and educational assistance is targeted to livestock-related problems.

Wetland Reserve Program - The program objectives are to restore and protect the function and values of wetlands adversely affected by agricultural activities. Since 1996, over 20 landowners have voluntarily applied to restore wetland ecosystems.

Wildlife Habitat Incentive Program - The program is authorized under the 1996 Farm Bill with funding for 2 years. Financial and technical assistance will emphasize fish and wildlife improvement. WV's special emphasis is neo-tropical songbirds, quail, threatened and endangered species habitat and improvement of riparian buffers.

Water Quality Incentive Program - This 3-year program is being implemented to achieve the source reduction of nonpoint source agricultural pollutants in an environmentally and economically sound manner. WV has 8 sub-watersheds approved providing technical and financial assistance to landowners to treat runoff from pastures, barnyards and cropland, and improve nutrient management for poultry and livestock.

Conservation Reserve Program - Protects highly erodible cropland and environmentally sensitive lands using permanent vegetation.

Wetland Conservation Program, Swampbuster - provisions of the 1985 and 1996 Farm Bill remove certain incentives for people to convert wetlands to agricultural use. Technical assistance is provided to producers to identify wetlands to assist in protecting function and values of the Nation's wetlands.

Gaol 3 – 19: Utilize USDA Environmental Quality Incentive Program and other available programs to provide financial assistance to implement water quality best management practices in watersheds targeted through the WV Watershed Management Framework – 2000 - 2005.

Objective 1: Participate in local work groups and state technical committee to ensure inclusion of NPS program goals – 2000 - 2005.

Objective 2: Assist in identifying needed best management practices in priority watersheds – 2000 - 2005.

Objective 3: Promote use of USDA funding by farmers in state priority watersheds – 2000 – 2005.

V. REGULATORY STRUCTURE

A referral system has been in place in WV since 1990 to assist with the implementation of the statewide NPS program. This system is a cooperative effort between the WV Division of Environmental Protection - Office of Water Resources, the WV Soil Conservation Agency, and the 14 WV Soil Conservation Districts that ensures a balance between technical assistance that results in BMP implementation and enforcement actions.

In 1999, the Agriculture Water Quality Position Paper was signed between WV DEP, US EPA, USDA NRCS, and WVDA to further define the above referenced referral system. A coordinated approach of technical assistance to potential violators, as identified by DEP, is in place.

VI. OTHER GOALS, OBJECTIVES, STRATEGIES

Goal 3 – 20: Work to address issues related to the urban/rural interface in the growing Eastern Panhandle and other areas of the state – 2000 - 2005.

Objective 1: Educate urban homeowners, and non-farm landowners on how their activities (application of chemical fertilizers and pesticides, etc.) affect water quality by holding 5 workshops on urban/rural issues - 2005.

Objective 2: Investigate and make available farmland protection/preservation opportunities for agriculture producers – 2000 - 2005.

Goal 3 – 21: Improve data management and tracking of BMPs to show and measure water quality improvements – 2000 - 2005.

Objective 1: Work with WVSCA GIS program to establish database of BMPs, costs, and water quality improvements – 2001.

Objective 2: Develop and maintain database of biosolids information – 2002.

Goal 3 – 22: Conduct conservation and water quality education presentations and programs – 2000 - 2005.

Objective 1: Work with Watershed Resource Center and other public and private groups to develop agriculture educational materials and programs – 2000 - 2005.

Objective 2: Conduct 5 agriculture workshops annually – 2000 - 2005.

Objective 3: Conduct 14 agriculture field days annually – 2000 - 2005.

Objective 4: Provide information and articles to NPS Newsletter, Today's Resources – 2000 - 2005.

Objective 5: Conduct education for schools, universities, public groups on agriculture and NPS pollution – 2000 - 2005.

Objective 6: Educate landowners on the potential problems associated with underground fuel storage and encourage the use of and conversion to aboveground facilities – 2002 - 2005.

Goal 3 – 23: Increase public involvement in agriculture NPS program.

Objective 1: Deliver the NPS program through the WV Soil Conservation Districts – 2000 - 2005.

Objective 2: Cooperate with WV Watershed Management Framework, Soil Conservation Districts, Watershed Associations to include the public in the identification of problems, prioritization of watersheds and the development and implementation of watershed strategies – 2000 - 2005.

Objective 3: Conduct general public outreach activities to educate the public on NPS issues and WV's approach to NPS management for agriculture – 2000 - 2005.

Objective 4: Publish and distribute newsletters, news articles, etc. to keep the public involved and aware – 2000 - 2005.

Objective 5: Through the Agriculture Technical Subcommittee evaluate and make recommendations for the NPS program for agriculture - 2004.

Sources of State, Federal and Other Technical Assistance and Funding:

WV Department of Agriculture
WV Soil Conservation Agency
WV Soil Conservation Districts
WV Division of Environmental Protection - Office of Water Resources
USDA Natural Resources Conservation Service
WVU Cooperative Extension Service
USDA FSA

VII. BEST MANAGEMENT PRACTICES, AGRICULTURE

West Virginia Practice Standards

PRACTICE CODE	PRACTICE NAME	DESCRIPTION
575	Animal Trails and Walkways	A travel facility for livestock and/or wildlife to provide movement through difficult or ecologically sensitive terrain.
757	Animal Use Area Protection	Practicing areas used for animal feeding, loafing, or confinement by surfacing with suitable materials, or by installing needed structures.
322	Channel Vegetation	Establishing and maintaining adequate plants on channel banks, berms, spoil and associated areas.
317	Composting Facility (3181)	A facility for the composting of the normal daily accumulation of dead birds from a poultry operation.
348	Dam, Diversion	A Structure built to divert part or all the water from a waterway or a stream into a different watercourse, an irrigation canal or ditch, or a water-spreading system.
402	Dam, Floodwater Retarding	A single purpose dam designed for temporary storage of floodwater and for its controlled release.
349	Dam, Multiple-Purpose	A dam constructed across a stream or natural watercourse that has a designed reservoir storage capacity for two or more purposes, such as floodwater retardation and irrigation water supply, municipal water supply, and recreation.
356	Dike	An embankment constructed of earth or other suitable materials to protect land against overflow or to regulate water.
362	Diversion	A channel with a supporting ridge on the

PRACTICE CODE	PRACTICE NAME	DESCRIPTION
		lower side constructed across the slope.
382	Fence	Enclosing or dividing an area of land with a suitable permanent structure that acts as a barrier to livestock, big game, or people (does not include temporary fences).
386	Field Border	A strip of perennial vegetation established at the edge of a field by planting or by converting it from trees to herbaceous vegetation or shrubs.
393	Filter Strip	A strip of area of vegetation for removing sediment, organic matter, and other pollutants from runoff and wastewater.
400	Floodwater Diversion	A graded channel with a supporting embankment or dike on the lower side constructed on lowland subjects to flood damage.
655	Forest Harvest Trails and Landings (408) (490)	Laying out, constructing and using forest harvest trails and landings.
490	Forest Site Preparation (652) (490)	Treating areas to encourage natural regeneration of desirable trees and shrubs or to permit artificial regeneration by planting or direct seeding.
666	Forest Stand Improvement (654)	To manipulate species composition and stocking by cutting or killing selected trees and under story vegetation.
410	Grade Stabilization Structures	A structure used to control the grade and head cutting in natural or artificial channels.
412	Grassed Waterway	A natural or constructed channel that is shaped or graded to required dimensions and established in suitable vegetation for the stable conveyance of runoff. Grassed waterways with stone centers are also included.

PRACTICE CODE	PRACTICE NAME	DESCRIPTION
548	Grazing Land Mechanical Treatment	Modifying physical soil and/or plant conditions with mechanical tools by treatments such as; pitting, contour furrowing, and ripping or sub-soiling.
561	Heavy Use Area Protection	Protecting heavily used areas by establishing vegetative covers, by surfacing with suitable materials, or by installing needed structures.
422	Hedgerow Planting	Establishing a living fence of shrubs or trees in, across, or around a field.
423	Hillside Ditch	A channel that has a supporting ridge on the lower side constructed across the slope at definite vertical intervals and gradient, with or without a vegetative barrier, otherwise protected.
468	Lined Waterway	A waterway or outlet having an erosion-resistant lining of concrete, stone or other permanent material. The lined section extends up the side slopes to designed depth. The earth above the permanent lining may be vegetated or protected.
512	Pasture and Hayland Planting	Establishing and reestablishing long-term stands of adapted species of perennial, biennial, or reseeding forage plants. (Includes pasture and hayland renovation. Does not include grassed waterway or outlet on cropland).
516	Pipeline	Pipeline installed for conveying water for livestock or for recreation.
378	Pond	A water impoundment made by constructing a dam or an embankment or by excavating a pit or dugout. Ponds constructed by the first of those methods are referred to hereafter as • Embank-ment Ponds• and those constructed by the latter method as • Excavated Ponds.• Ponds resulting from

PRACTICE CODE	PRACTICE NAME	DESCRIPTION
		both excavation and embankment are classified, as • Embankment Ponds• where the depth of water impounded against the embankment at emergency spillway elevation is 3 feet or more.
521A	Pond Sealing or Lining, Flexible Membrane	Installing a fixed lining of impervious material or treating the soil in a pond mechanically or chemically to impede or prevent excess water loss.
521B	Pond Sealing or Lining, Soil Dispersant	Installing a fixed lining of impervious material or treating the soil in a pond mechanically or chemically to impede or prevent excessive water loss.
521C	Pond Sealing or Lining, Bentonite Sealant	Installing a fixed lining of impervious material or treating the soil in a pond mechanically or chemically to impede or prevent excessive water loss.
521D	Pond Sealing or Lining, Cationic Emulsion Waterborne Sealant	Installing a fixed lining of impervious material or treating the soil in a pond mechanically or chemically to impede or prevent excessive water loss.
521 E	Pond Sealing or Lining, Asphalt-Sealed Fabric Liner	Installing a fixed lining of impervious material or treating the soil in a pond mechanically or chemically to impede or prevent excessive water loss.
533	Pumping Plant for Water Control	A pumping facility installed to transfer water for a conservation need, including removing excess surface or ground water, filling ponds, ditches or wetlands, or pumping from wells, ponds, streams, and other sources.
568	Recreation Trails and Walkways	A pathway prepared especially for pedestrian, equestrian and cycle travel.
391	Riparian Forest Buffer	An area of trees and/or shrubs located adjacent to and up-gradient from water bodies.

PRACTICE CODE	PRACTICE NAME	DESCRIPTION
558	Roof Runoff Management	A facility for collecting, controlling and disposing of runoff water from roofs.
350	Sediment Basin	A basin constructed to collect and store debris or sediment.
572	Spoil Spreading	Disposing of surplus excavated materials.
574	Spring Development	Improving springs and seeps by excavating, cleaning, capping or providing collection and storage facilities.
728	Stream Crossing or Access	A stabilized area to provide for crossing of a stream by livestock and farm machinery, or to provide access to the stream for livestock water.
584	Stream Channel Stabilization	Stabilizing the channel of a stream with suitable structures.
580	Streambank and Shoreline Protection	Using vegetation or structures to stabilize and protect banks of streams lakes, estuaries, or excavated channels against scour and erosion.
587	Structure for Water Control	A structure in irrigation, drainage or other water management system that conveys water, controls the direction or rate of flow, or maintains a desired water surface elevation.
606	Subsurface Drain	A Conduit, such as corrugated plastic tubing, tile, or pipe, installed beneath the ground surface to collect and/or convey drainage water.
607	Surface Drainage-Field Ditch	A graded ditch for collecting excess water in a field.
608	Surface Drainage, Main or Lateral	An open drainage ditch constructed to a designed size and grade.
600	Terrace	An earth embankment, a channel, or a combination ridge and channel constructed

PRACTICE CODE	PRACTICE NAME	DESCRIPTION
		across the slope.
612	Tree/Shrub Establishment	To establish woody plants by planting or seedling.
660	Tree/Shrub Pruning	Removing all or parts of selected branches from trees and shrubs.
620	Underground Outlet	Conduit installed beneath the surface of the ground to collect surface water and convey it to a suitable outlet.
472	Use Exclusion (472)	Excluding animals, people, or vehicles from an area.
312	Waste Management System	A planned system in which all necessary components are installed for managing liquid
313	Waste Storage Facility	A waste impoundment made by constructing an embankment and/or excavating a pit or dugout, or by fabricating a structure.
359	Waste Treatment Lagoon	An impoundment made by excavation or earth fill for biological treatment of animal or other agricultural waste.
638	Water and Sediment Control Basin	An earth embankment or a combination ridge and channel generally constructed across the slope and minor watercourses to form a sediment trap and a water detention basin.
614	Watering Facility (648)	Constructing, improving or modifying watering facilities for wildlife.
642	Well	A well constructed or improved to provide water for irrigation, livestock, wildlife, or recreation.

Chapter 4 - Construction

I. OVERALL GOAL

The WV NPS Program for construction is designed to provide education, technical assistance and regulatory mechanisms to reduce sediment and other nonpoint source impacts on surface and ground water from construction activities.

In addition to an overall statewide approach, the WV NPS program for construction will focus activities on priority watersheds identified through the WV Watershed Management Framework.

II. BACKGROUND

Construction and development in WV is an ongoing activity. Highway construction, residential development, and commercial development are on the rise as the state of WV attempts to improve its economy. As a rule, due to the significant amount of space available in WV, though much of this is either on steep hillsides or in flood plains, most communities grow out rather than up, causing a greater surface area of disturbance and associated run off. Such growth also increases the amount of impervious surfaces and the quantity and quality of run off.

Disturbed acreage exceeds 32,000 acres annually. Construction sites greater than 3 acres require a NPDES permit, which includes the submission of a sediment and erosion control plan, and implementation of the identified best management practices (BMPs). On construction sites of less than 3 acres, submission of a sediment control plan is highly encouraged by the NPS personnel and local Soil Conservation Districts, however, the program is voluntary. The sediment control plan includes the location of the construction site, the name, address, and phone number for the landowner, contractor and/or developer, and what practices will be implemented to control sediment and erosion.

III. ENVIRONMENTAL IMPLICATIONS

Soil is the largest pollutant source by volume in WV's waterways. Excessive sedimentation in lakes, rivers and streams reduces the recreational value of these resources, plugs culverts, destroys aquatic habitats, increases the potential for flooding and increases drinking water treatment costs. In addition, fertilizers, pesticides and other pollutants such as motor oil, antifreeze or spilled fuel, can attach themselves to soil particles and be transported in waterways by stormwater runoff.

IV. EXISTING PROGRAMS

Construction Sites Less than 3 Acres:

For construction sites of less than 3 acres, a system has been implemented by which Construction Sediment Control Plans are submitted to the Soil Conservation Districts, and are reviewed by the NPS personnel in that area. In WV, construction sites of less than 3 acres are not subject to the regulations governing the NPDES permitting process. Therefore, it is the responsibility of the NPS personnel and the local SCD to encourage voluntary submission of sediment and erosion control plans. This involves both education and technical assistance to get plans designed and implemented. This program has led to a considerable amount of participation by contractors and developers, however, there still remains a great deal of disturbed land in WV that is not covered under a sediment control plan.

Construction Sites Greater Than 3 Acres: Stormwater Permit

V. GOALS, OBJECTIVES, STRATEGIES

Goal 4 – 1: Provide support to and coordination with WV Watershed Management Framework to identify, prioritize, and implement watershed projects – 2000 - 2005.

Objective 1: Participate in interagency steering committee to determine priority watersheds – 2000 - 2005.

Objective 2: Assist in collecting and summarizing data regarding construction activities – 2000 - 2005.

Objective 3: Assist in the development of construction water quality management objectives and options for watershed restoration action strategies – 2000 - 2005.

Objective 4: Determine and document the most effective best management practices and/or management options – 2000 - 2005.

Objective 5: Provide BMP technical assistance to contractors and developers in identified priority watersheds – 2000 - 2005.

Objective 6: Assist in monitoring the progress of the construction portion of the watershed action plans – 2000 - 2005.

Goal 4 – 2: Provide support and guidance to local watershed associations with construction nonpoint source issues – 2000 – 2005.

Objective 1: Conduct a continuous assessment to determine where assistance is necessary – 2000 - 2005.

Objective 2: Assist in the development of local watershed plans – 2000 - 2005.

Objective 3: Coordinate with USDA, DEP, DNR, the WV Watershed Network and others to provide resources to local watershed groups – 2000 - 2005.

Objective 4: Support the WV Stream Partners Program – 2000 - 2005.

Goal 4 – 3: Reduce erosion of 108,000 tons of soil on 1200 acres of construction sites and other disturbed areas by 2002.

Objective 1: Review approximately 150 Construction Sediment Control Plans annually.

Objective 2: Offer technical assistance on all construction and disturbed areas – 2000 - 2002.

Goal 4 – 4: Obtain consistent implementation and maintenance of construction BMPs by contractors by providing routine, on-site technical assistance to contractors and developers in cooperation with WVDEP - 2000 - 2005.

Goal 4 – 5: Educate contractors, developers, engineers and other professionals on construction nonpoint source issues and best management practices – 2000 - 2005.

Objective 1: Finalize construction BMP manual for WV contractors and developers - 2001.

Objective 2: Hold watershed based construction BMP workshops for contractors, etc. through the Watershed Resource Center – 2000 - 2005.

Objective 3: Participate in WV Contractors EXPO through displays and presentations – 2000 - 2005.

Objective 4: Make nominations and award state winner of Conservation Contractor and Developer of the Year Contest – 2000 - 2005.

Goal 4 – 6: Educate the general public including schools on construction nonpoint source issues and best management practices using the Enviroscape® and the Watershed Resource Center – 2000 - 2005.

Objective 1: Make presentations to civic groups, schools and at other public places on the effects and benefits of construction and stormwater management – 2000 - 2005

Objective 2: Encourage the use of the public media by Soil Conservation Districts to increase understanding of sediment and erosion control – 2000 - 2005.

Goal 4 – 7: Improve the understanding of local governments on the need for regulations and adequate construction and stormwater management programs in identified priority watersheds – 2000 - 2010.

Objective 1: Focus on educating the residents, contractors, engineers, local planning commissions, and governments to incorporate stormwater management, sediment and erosion control considerations and BMPs into current regulatory program – 2000 - 2005.

Objective 2: Make presentations to local planning commissions and governments on the benefits of construction and stormwater management programs – 2000 – 2005.

Goal 4 – 8: Improve stormwater management in West Virginia – 2000 - 2010.

Objective 1: Strengthen NPDES permitting requirements to include post construction / permanent best management practices for stormwater management - 2002.

Objective 2: Integrate urban runoff best management practices to prevent pollution due to the increase of impermeable surfaces that accompanies development – 2000 - 2005.

Objective 3: In cooperation with local government, review storm water control design simultaneously with erosion control plan review – 2000 - 2005.

Objective 4: Provide technical and financial assistance to local governments, communities, and watershed groups on stormwater management – 2000 - 2005.

Goal 4 – 9: Provide information to contractors, developers and landowners on the potential for groundwater impacts from construction activities and ways these might be reduced – 2000 - 2005.

Objective 1: Assist in the development of Groundwater Protection Plans (GPPs) for construction activities to reduce the potential for pollution of groundwater during construction.

Objective 2: Incorporate information on groundwater impacts from construction and associated best management practices into workshops provided through the Watershed Resource Center.

Goal 4 – 10: Increase public involvement in construction NPS program – 2000 – 2005.

Objective 1: Deliver the NPS program through the WV Soil Conservation Districts – 2000 - 2005.

Objective 2: Cooperate with WV Watershed Management Framework, SCDs, and watershed groups to include the public in the identification of problems, prioritization of watersheds and the development and implementation of watershed restoration action strategies – 2000 – 2005.

Objective 3: Coordinate general public outreach activities to educate the public on NPS issues and WV's approach to NPS management for construction – 2000 - 2005.

Objective 4: Publish and distribute newsletters, news articles, etc. to keep the public involved and aware – 2000 – 2005.

VI. SOURCES OF STATE, FEDERAL AND OTHER ASSISTANCE AND FUNDING

WV Division of Environmental Protection - Water Resources
WV Division of Environmental Protection - Environmental Enforcement
WV Soil Conservation Agency
WV Soil Conservation Districts
USDA Natural Resources Conservation Service

Chapter 5 - West Virginia Watershed Resource Center

I. OVERALL GOAL

The Watershed Resource Center (WRC), an expansion of the Nonpoint Source (NPS) Resource Management Training Center, is a cooperative project conducted by the WV Soil Conservation Agency, WV Department of Education, WV Division of Environmental Protection and the US Environmental Protection Agency. The main objective of this partnership is to combat nonpoint source pollution in West Virginia and reduce impacts through education and information to watershed groups, local, state and federal agencies and other members of the general public.

The Watershed Resource Center will refocus its energy and resources towards providing training, information transfer and assistance to the numerous local watershed associations and groups that are forming throughout West Virginia. Development of the resources needed by watershed groups, agencies, and others, both physical and web based, will be a high priority. In addition, specific training and education identified by local groups as necessary to understand their watershed and the nonpoint source impacts and solutions available to them will be provided.

II. BACKGROUND

A great deal of information on the control of nonpoint source (NPS) impacts on water quality exists. However, the current delivery system does not allow this information to reach a broad spectrum of land users. All individuals and groups who disturb the soil, in association with their occupations, need a resource center where information and training on the control of NPS impacts can be obtained. Land users needing such a facility include urban developers, loggers, farmers, earth moving contractors, and consulting engineers. Many sources of NPS pollution result from the activities of land users who have no comprehension of the severity of the problem. Nor do they have the knowledge to resolve the problem once they become aware of it.

The West Virginia Watershed Resource Center at Cedar Lakes, West Virginia provides information on water quality enhancement to all groups of land users. The Watershed Resource Center operates through the cooperative efforts of the WVU Cooperative Extension Service, the WV Division of Forestry, the various offices of the WV Division of Environmental Protection, the WV Soil Conservation Agency, UDSA, the 14 West Virginia Soil Conservation Districts, and other public and private entities and groups. Specific training sessions are available for watershed groups, federal, state and local government, the general public as well as all whose professions require land-disturbing activities. The facility includes a modern technology transfer center, including a library of pertinent publications, videos, and samples of erosion control materials.

III. ENVIRONMENTAL IMPLICATIONS

The environmental implications that result from a lack of knowledge can occur in any category of nonpoint source pollution. These can include siltation of streams from timbering operations, the pollution of groundwater from improperly constructed oil wells, impacts from bacteria and nutrients to surface waters from animal wastes, and impacts from chemical fertilizers from over application by homeowners. Education of the general public as well as the specific individuals whose professions impact water quality through nonpoint sources will ultimately lead to the implementation of best management practices and the improvement of water quality statewide.

IV. EXISTING PROGRAMS

Training programs for professionals have been developed and are updated for the categories of agriculture, construction, highways design, construction, and maintenance, forestry, and oil and gas extraction. Workshops and seminars include information on Best Management Practices (BMPs) to reduce water quality impacts, regulations and regulatory requirements, where to obtain technical assistance, safety, and other topics requested or needed by the target audience. The Watershed Resource Center can help determine curriculum content, identify speakers, identify target-training groups, and coordinate the general logistics of training.

The Watershed Resource Center currently serves West Virginia, as well as surrounding states in the technology transfer and facilitation of NPS training and BMP implementation. Since the development of the Resource Center, the center has coordinated the training of over 7000 individuals and provided information to many others.

The enhanced focus of the Watershd Resource Center will be to provide information and training through the Center and local Soil Conservation Districts, to the abundance of watershed groups forming throughout West Virginia. To date over 86 watershed groups exist. Many of the issues impacting the quality of life and communities of the individuals who make up these groups are related to nonpoint source pollution including acid mine drainage, agriculture, forestry, oil and gas extraction, construction, and sewage.

The WRC's watershed focus will also include increased coordination between the efforts of the Watershed Management Framework, particularly with regard to the targeting of training an information transfer into those watersheds identified as priorities and scheduled for strategy development and implementation through the Framework process.

The WRC houses a resource library to provide for a centralized location where individuals and groups can obtain information about their watershed and the options available to them to address the issues they have identified as important. In addition, the

the Watershed Resource Center website will be substantially developed to provide interactive watershed based information. Other available materials will include watershed assessments developed by various entities including USDA Natural Resources Conservation Service, WV Division of Environmental Protection's Watershed Assessment and SOS programs, and the Watershed Management Framework group. A checklist of available materials will be developed and sent directly to the Soil Conservation Districts and watershed associations.

Through the WRC, 2 watershed atlases will be constructed per year for the web site at an 8-diget-watershed scale. The WVSCA Information and GIS Specialists will provide the technical assistance necessary to upgrade the WRC's existing computer system, then develop and maintain the WRC web site and atlases.

The WRC will be responsive to the training needs of the WV Watershed Network and will provide support to that end. Historically, 2 workshops have been held for watershed associations in 2 different geographic locations. The WRC will also work jointly with the NPS Environmental Specialists located throughout the state to provide specific targeted training to the watershed groups they are working with. These workshops will be based on the identified needs within the watershed. The historical relationships that have been developed through the Training Advisory Committees of the Center on the issue areas of oil and gas, construction, agriculture and forestry will be utilized to provide this targeted training. In addition, new relationships will be fostered and developed to serve the identified watershed needs that cannot be met through the current system.

The WRC's quarterly newsletter, "Watershed Resources", will continue to be distributed to over 1000 individuals each quarter. This newsletter, which historically highlighted the nonpoint source activities in West Virginia, will expand to include information on the nonpoint source activities of specific watershed groups. This process will be facilitated through the watershed support work being conducted by the NPS Environmental Specialists located throughout the state. A public outreach plan will stay in effect including interaction with the media and displays. The display will be updated to include our watershed management approach.

The Watershed Resource Center will continue to be an active partner in the WV Envirothon, a problem solving competition for vocational, technical and home schools plus environmental groups and clubs. The WRC educational outreach programs for student and teachers including development and distribution of study packets, classroom aids, demonstrations, assistance with statewide conservation camps, promotion and coordination of the SAMARA competition and educational outreach related to the Enviroscape® will continue.

V. GOALS, OBJECTIVES, STRATEGIES

Goal 5 – 1: Provide support, education and information to WV's watershed based management efforts – 2000 - 2005.

Objective 1: Maintain library of information to provide information relevant to watersheds – 2000 - 2005.

Objective 2: Maintain the website with interactive information useful to watershed groups, agencies and others – 2000 - 2005.

Objective 3: Include watershed associations in relevant mailings of information such as workshops, newsletter, etc. – 2000 – 2005.

Objective 4: Assist with public outreach and information transfer for WV Watershed Network – 2000 - 2005.

Objective 5: Assist with public outreach and information transfer for WV Watershed Management Framework – 2000 - 2005.

Objective 6: Coordinate the development of 2 watershed atlases based on the 8-digit hydrologic unit code for inclusion on the interactive web page – 2000 – 2003.

Goal 5 – 2:: Provide training and information transfer for watershed associations, agencies, and the general public on nonpoint source pollution, watershed management, and NPS best management practices – 2000 - 2005.

Objective 1: Provide support to the WV Watershed Network in conducting 2 training activities for watershed associations – 2000 – 2005.

Objective 2: Coordinate with NPS Environmental Specialists to provide 4-targeted NPS technical workshops to watershed associations – 2000 - 2005.

Objective 3: Coordinate workshops identified in the WV Watershed Management Framework watershed restoration action strategies – 2000 - 2005.

Goal 5 – 3: Assist in the outreach and recognition for watershed activities – 2000 - 2005.

Objective 1: Develop a display to promote and support the watershed activities of the WRC and the State - 2001.

Objective 2: Publish *Watershed Resources* newsletter to include articles related to watershed efforts – 2000 - 2005.

Objective 3: Provide support to the WV Watershed Network for Water Celebration Day – 2000 - 2005.

Objective 4: Develop and coordinate a WV Soil and Water Conservation Partnership Watershed Conservation Awards program – 2005.

Goal 5 – 4: Promote an understanding of nonpoint source issues, conservation education, watershed management, and NPS best management practices – 2000 - 2005.

Objective 1: Exhibit at activities, conferences and field days – 2000 - 2005.

Objective 2: Transfer information received by the WRC to watershed associations, agencies, the general public and industry through mailings, *Watershed Resources* newsletter, and library requests – 2000 - 2005.

Objective 3: Develop website of information re: training activities, library materials, and other information – 2001.

Objective 4: Maintain Website of information re: training activities, library materials available and other information – 2000 – 2005.

Objective 5: Manage and distribute *Watershed Resources* Newsletter – 2000 – 2005.

Objective 6: Coordinate training and exhibit for the WV Equipment and Technology Design Exposition (Contractor's EXPO) – 2000 - 2005.

Objective 7: Coordinate Contractor and Developer of the Year Awards Program through, WVSCA, WV DEP, USDA NRCS and WV's 14 Soil Conservation Districts – 2000 – 2003.

Objective 8: Provide support to WV Envirothon – 2000 - 2005.

Objective 9: Host National Envirothon – 2004.

Objective 10: Provide conservation education and information to educators, youth and the general public through the WV Conservation Education Council, WV Conservation Camp, Enviroscape presentations, and SAMARA program – 2000 - 2005.

Objective 11: Provide support to the WV Soil and Water Conservation Partnership Annual Conference – 2000 - 2005.

VI. SOURCES OF STATE, FEDERAL AND OTHER ASSISTANCE AND FUNDING

WV Division of Environmental Protection, Office of Water Resources - The lead agency for overall program management.

State NPS Coordinating Review Board - Will run the NPS program in the State of West Virginia as stated in the state management plan.

West Virginia Soil Conservation Agency – The lead agency for the agriculture and construction 319 Program in the State of West Virginia.

Soil Conservation District - The district will serve on the advisory committee, provide resource materials for the library, solicit local support, sponsor workshops, request technical assistance from the USDA Natural Resources Conservation Service to develop and conduct training sessions, and other activities which will promote the success of the project.

USDA Natural Resources Conservation Service - Will serve on the advisory committee, provide technical assistance to develop and conduct training sessions, provide resource materials for the library, and other activities, which will promote the success of the project.

Cedar Lakes/ WV Department of Education - Provide the site including 250 square feet of office space, 50-person classroom, audiovisual equipment, and logistical support at no cost.

WVU Cooperative Extension Service – Provide technical experts, speakers, etc. for trainings and workshops.

Other State Agencies – Provide technical experts, speakers, etc. for training and workshops related to nonpoint source pollution and their area of expertise.

WV Watershed Network – Provide a forum for information exchange and identification of training needs. Sponsors and coordinates Water Celebration Day.

WV Watershed Management Framework – Provides guidance on priority watersheds, develops and assists with implementation of watershed restoration action strategies.

Watershed Associations – Identify issue areas of concern for training, education and information transfer by the WRC.

Partner agencies and groups include:

Independent Oil and Gas Association
West Virginia Oil and Natural Gas Association
Columbia Natural Resources
West Virginia Society of American Foresters
The West Virginia Soil Conservation Committee
The West Virginia Soil Conservation Districts
USDA Natural Resources Conservation Service
West Virginia University Cooperative Extension Service
West Virginia University

West Virginia Division of Environmental Protection
West Virginia Division of Highways
West Virginia Farm Bureau
West Virginia Division of Forestry
West Virginia Grazing Lands Steering Committee
West Virginia Environmental Training Center-Point Source
West Virginia Department of Education
Du Pont Belle Corporation
West Virginia Tree Farm Association
West Virginia Forestry Association
USDA Forest Service
Eastern American Energy Corporation
WV Association of Land Surveyors

Chapter 6 - Silviculture

I. OVERALL GOAL

The West Virginia Division of Forestry Nonpoint Source Silvicultural Program is aimed at reducing the impacts or potential impacts on water quality from silvicultural and associated forestry activities. This effort is recognized in most of the WV Division of Forestry programs and promoted through education and technical assistance to non-industrial private landowners, forest industry, other state agencies and the general public to enhance and protect a sustainable forest resource.

II. BACKGROUND

West Virginia has approximately 12 million acres of forest land of the States 15.4 million acres. It is estimated the total volume of wood in the state is 70 billion board feet, up from 67.1 billion in 1989. Private non-industrial landowners control nearly 90 percent of the forested land.

The wood product industry continues to create more jobs in West Virginia. Direct business volume for wood products provided 16,500 jobs and generated 1.9 billion dollars. Indirect impacts brought those totals to 29,000 jobs and 3.1 billion dollars in business volume. In 1999 there were 3,300 timber harvesting operations involving 282,000 acres of woodland. The most recent forest inventory conducted in 1995 indicated a harvest level of 1.1 billion board feet of saw timber per year. This level had almost doubled since the last inventory conducted in 1989. Even with the increased level of harvest, growth is exceeding harvest by two times. The inventory showed growth per year at 2.3 billion board feet.

With the increase in the wood product industry, more opportunity is present to prescribe silvicultural treatments to forested lands. These systems improve stand quality and health by removing poor quality and undesirable species, thin to increase growth rate and remove damaged trees due to insect, disease, fire or other weather problems. This has opened the door to better forest management for landowners striving to meet their individual goals and objectives.

Wildfire in the state's woodland continues to be one of the most important environmental and management problems due to extremely heavy sediment loads into the streams. Over the past several years 1400 fires per year have occurred burning nearly 100,000 acres per year on the average. It is estimated that more than a half million acres of forest land now has decaying timber caused by wildfire.

III. ENVIRONMENTAL IMPACTS

Studies show that a timber harvest operation disturbs 8-10 percent of the total area in road construction and landing sites. These areas, if not properly maintained, can contribute to erosion and sedimentation. Improperly performed logging operations and related activities that are poorly planned and constructed roads and landings can cause soil loss and sedimentation.

Although silvicultural systems themselves are ecologically sound, the measures to carry them out may be environmentally damaging if improperly applied. Site preparation and tree planting offer few threats to water and soil and is usually considered a long term benefit to these resources. Some damages can occur if heavy planting equipment is used. Heavy equipment can compact soils, create furrows and ruts which accelerate water flow and thus erosion.

Wildfires drastically reduce woodland values, potential timber production, result in property loss, timber mortality, wildlife habitat destruction and hinder aesthetic appeal to woodlands. These are obvious destructive results and most have been considered previously. However, there is a study that shows extensive erosion can result from forest fires. The study concluded that both high intensity fires and repeatedly burned forests are sources of severe soil erosion and, consequently, water pollution.

Pesticide use in the practice of silviculture in West Virginia is extremely limited. The only major ongoing pesticide use program involves the control of gypsy moth in the northern portion of the State. An environmental assessment of this project is published annually. Chemical fertilizers are not currently used in silviculture in West Virginia. If used in the future, threats to the environment would be minimized by adherence to federal and state regulations covering chemical use and storage, transportation, and handling.

IV. EXISTING PROGRAMS

All programs or parts there of the Division of Forestry is involved with either establishes, protects or enhances forest health and productivity which results in improved water quality, wildlife habitat, recreation and aesthetics. The division administers several state and federally funded programs that relate to the Water Quality Program. They are: Logging Sediment Control Act, Forest Protection, Cooperative Forest Management, Urban and Community Forestry, Stewardship Incentive Program, Forest Incentive Program and Watershed Management. Many of the programs described would not be as effective if not for the six Division of Forestry district and associated field office participation and support.

A. Logging Sediment Control Act

From 1971 through 1992 West Virginia approached impacts to water quality from timber harvesting operations through voluntary compliance. Although effective, the West Virginia Legislature thought it in the best interest of the State that present sediment control activities be expanded and strengthened. The Legislature passed the Logging Sediment Control Act of 1992 and designated the Division of Forestry as the responsible agency to carry out the mandates and provisions. The law establishes a process for logger licensing, logger certification, timber operation notification, posting and best management practice implementation.

As part of the logger certification process, a logger must successfully complete training in tree felling and personal safety, first aid and silvicultural best management practices. Certified loggers must be recertified by attending an update course every three years. Each logging crew is required to be supervised by a certified logger.

The Division of Forestry monitors compliance and effectiveness of the Logging Sediment Control Act through complaint investigations, compliance checks and tracking timbering operation notifications. Any complaint received concerning a timbering operation will be investigated to determine operation compliance and any corrective measures required. Compliance checks are conducted on each operator at least once each calendar year. Tracking of notifications will allow access to information on the operator, best management use and operation location.

Forest harvest and management activities result in a small amount of sedimentation in relation to other sources. Although, this amount or potential amount is significant enough that best management practices are utilized to lesson or eliminate sedimentation. As part of the Logging Sediment Control Act, guidelines for best management practices are required for logging operations and can further be reviewed in Division of Forestry publication WVDOF-TR-96-3. Due to one of the major timber harvesting and water quality forest research centers located at Parson in Tucker County, West Virginia has been a leader in developing nonpoint erosion control measures.

Goal 6 – 1: Administer the Logging Sediment Control Act which will reduce the impacts or potential impacts to water quality. 2000-2005

Objective 1: Provide training to 1,500 loggers per year, which satisfies the certification process.

Objective 2: Monitor compliance with the Logging Sediment Control Act and effectiveness of required best management practices. Improve compliance levels by 5 percent within 5 years.

a. Investigate every timbering operation complaint. (600 per year)
b. Track timbering operation notifications per county. (3,250 state total per year)
c. Visit each operator at least once per calendar year. (1,500 per year)

Objective 3: Convene a best management practice review committee at three year intervals.

Goal 6 – 2: Educate industry and consulting foresters along with private non-industrial landowners on the use and advantages of best management practices.

Objective 1: Hold 2 special silvicultural training sessions per year.

Objective 2: Provide literature to private non-industrial landowners. This will be accomplished through fairs, festivals and presentations to 40,000 people per year.

B. Forest Protection

Prevention is the first of a three part fire program enacted by the Division of Forestry. Field personnel educate the general public in many different forums about the damaging effects of forest fires. These forums may include a fair or festival, a school talk or a presentation to a club or association. The largest audience may be reached in a newspaper article or television spot. Educating the general public and preventing the fire from ever starting is the key to prevention.

Even as successful as a prevention program may be, even at reduced levels, there will always be fires to control. Being able to detect these fires as quickly as possible is the key to reducing the devastating effect they can cause. The Division of Forestry relies heavily on the general public to report any forest fires. The division does utilize areal detection during dry periods in the fire season, but is limited to one plane covering several counties at a time. A new addition to the divisions fire prevention and detection program is a bloodhound dog capable of tracking, by scent, an arsonist. The bloodhound has paid dividends as a prevention and detection tool.

Fire suppression is achieved through a cooperative effort between the Division of Forestry and volunteer fire departments along with the utilization of trained crews coordinated by division personnel. An areal water tanker has also been part of a fire suppression effort for initial attack.

To ensure the changes, trends or status in health, West Virginia's forest are monitored. The division is participating in the National Forest Health Monitoring Program. This program involves visiting permanent plots yearly to assess vegetation diversity, tree crown conditions, tree and ozone damage and lichen populations.

Goal 6 – 3: Reduce the occurrence and size of fires and protect the forest land from insect and disease problems by developing a strong prevention program in each county.

Objective 1: Increase fire prevention announcements in newspapers, radio and television to 2 per county per year.

Objective 2: Provide 425 programs to schools, clubs and associations reaching approximately 35,000 kids per year.

Objective 3: Attend 110 fairs, festivals or other activities and distribute literature on the fire program to approximately 37,000 people per year.

Objective 4: Prepare fire plans for woodland home subdivisions as needed.

Goal 6 – 4: Enhance detection capability and increase suppression activity.

Objective 1: Use additional seasonal patrolmen for detection and rapid crew deployment, located in trouble areas.

Objective 2: Use of satellite imagery

Objective 3: Use of aerial tanker(s).

Objective 4: Hold 100 training sessions to Train 2,300 fire fighters, wardens and VFDs in suppression skills.

Goal 6 – 5: Monitor and protect forest health

Objective 1: Monitor 40 plots per year while participating in the National Forest Health Monitoring Program.

Objective 2: Implement management activities to reduce or eliminate impacts of insect and disease annually.

Objective 3: Continue cooperation with the Dept of Agriculture on gypsy moth suppression annually.

C. Cooperative Forest Management

Technical assistance to private non-industrial landowners in proper forest management activities is the main thrust of the cooperative forest management program. Assistance may involve timber sales, tree planting plans, developing forest management plans, forest access road layout, thinning and releases of forest stands, insect and disease detection and information and education.

The Division of Forestry is responsible for managing the nine State Forests involving nearly 80,000 acres. Multiple-use resource management principles are emphasized in the management of these public lands which can be further reviewed in publication WVDOF-TR-96-2 from the Division of Forestry. Forest management and planned timber harvesting on state forests act as educational areas showing the benefit these activities have on wildlife, watershed protection and water quality and increased recreational opportunities for various groups. State forests demonstrate utilization of forest resources and protecting forest productivity, water quality, wildlife habitat and recreational activities are not incompatible goals.

Forest management that increases environmental and economic benefits of forest land is the goal of the West Virginia Forest Stewardship Program. This program offers written guidance for private woodland owners and farmers, hunt clubs, watershed associations or wildlife enthusiasts to protect and improve the timber, wildlife, soils, water and recreation values for themselves, the public or future landowners. Over 3,274 plans have been developed covering approximately 562,000 acres through June 2000.

The West Virginia Tree Farm Program also encourages private forest landowners to properly manage their woodlands to ensure a sustainable level of forest products while protecting wildlife habitat, water quality and recreational opportunities. Mainly a recognition program, current and practical information through publications, newsletters and other mailings on all topics concerning landowners is also a benefit of the program. Currently, West Virginia has over 750 landowners covering approximately 1 1/2 million acres in the Tree Farm Program.

Goal 6 – 6: Encourage forest management on all forest land which will ensure a productive forest and enhance water quality. 2000-2005

Objective 1: Assist 4,000 private non-industrial landowners in forest management per year.

Objective 2: Write 20 management plans per year.

Objective 3: Provide 80programs per year on forest management to clubs, associations and other various groups.

Goal 6 –7: Conduct multiple-use management on public lands.

Objective 1: Demonstrate multiple-use principles through timber harvests.

Objective 2: Provide areas for recreational users such as hikers, bikers, fisherman and hunters.

Objective 3: Conduct 8 tours per year on state forests that demonstrate multiple-use principles.

Objective 4: Develop and implement 200 management plans with consulting foresters.

Goal 6 – 8: Promote and service the West Virginia Tree Farm Program, which requires a management plan for involvement.

Objective 1: Conduct 130 inspections per year

Objective 2: Assist with article writing in the Tree Farm newsletter.

Objective 3: Inform private non-industrial landowners about the program and its benefits.

D. Urban and Community Forestry

Although much of West Virginia is rural, and many think of forestry only existing in rural areas, forestry in urban areas is an important program. Water quality is greatly affected by an urban forestry program. Trees provide organic matter on the surface and roots increase the permeability of the soil resulting in reduced soil erosion and sedimentation of streams, chemicals transported to streams and creeks are reduced, reduced surface runoff from storms and an increase in ground water recharge. Many cities have come to realize these benefits to water quality and others through participation in the urban forestry program. Tours of these Tree Cities are conducted to show these benefits to other cities and to encourage their involvement.

Goal 6 – 9: Increase communities involved with the Urban Forestry Program. 2000-2005

Objective 1: Provide assistance to those cities interested in the Tree City USA program (5 per year).

Objective 2: Conduct 4 tours of Tree Cities per year to show benefits and results.

Objective 3: Promote urban beautification and tree health with 20 grants per year for projects that address beautification and tree health.

Objective 4: Provide technical assistance to 50 cities and 200 homeowners per year on tree care and maintenance to increase health.

E. USDA Programs

The Forest Stewardship Incentive Program (SIP) is federally funded and provides financial assistance to those landowners who have had stewardship plans developed for their woodland. Cost-share assistance for practices is the base for SIP encouraging improvement of soil and water quality, fish and wildlife habitat, wood products, protect aesthetics and enhance recreational activities.
The Forest Incentive Program (FIP) is a federally funded program promoting timber production. Cost-share is available to those landowners needing assistance with tree planting or thinning of overstocked forest stands. Although directed to timber production, many benefits can be received from tree planting and thinning to improve tree quality and production.

Goal 6 – 10: Support the Stewardship Incentive Program (SIP) and Forest Incentive Program (FIP) and promote increased landowner involvement. 2000-2005

Objective 1: Inform 300 private non-industrial landowners per year of various programs that will assist in managing their resource.

Objective 2: Assist with implementing programs by providing technical support on various planned activities.

F. Watershed Management Approach

Being led by the West Virginia Division of Environmental Protection Agency, a new approach to a cooperative effort among several state and federal agencies and with a public process, identification and implementation to watershed mange has evolved. Thirty-two hydrologic regions will be assessed and prioritized as to needs for improvement or protection. Each appropriate stakeholder agency or group will provide the available resources to this end or in development and implementation of a particular watershed management plan. The Division of Forestry sees this as an opportunity to promote forest management on a watershed level approach as opposed to traditional individual stand levels.

Even before the statewide watershed approach, the Division of forestry has been involved in some watershed projects. Seven watersheds in a five county area in the eastern panhandle are presently served by the Potomac Flood Prevention Program. Howards Creek Watershed incorporates 50,524 acres of woodland. Both areas have different factors influencing the watershed but share an overall goal of the division to educate and train forest landowners regarding the benefits and importance that can be realized from proper management and protection of their resource.

Goal 6 – 11: Cooperatively manage watersheds as a whole with other players and achieve common goals with sound forestry management practices. 2000-2010

Objective 1: Promote the Forest Stewardship Program so as to increase the number of planned acres in the Upper Elk Watershed. 2002

Objective 2: Promote the Forest Stewardship Program within WV's priority watersheds. This will be achieved through workshops, WV's Stream Partners Program, Watershed Framework and the Forest Steward Publication. annually

Objective 3: Train and educate 1,500 loggers and 300 private non-industrial landowners per year regarding proper timber harvesting techniques.

Objective 4: Promote sound environmentally sensitive management of riparian buffer zones through distribution of WV's silvicultural best management practices book, 2000 per year.

Objective 5: Participate to identify, prioritize and implement watershed projects as part of the watershed management framework.

V. SOURCES OF STATE, FEDERAL AND OTHER ASSISTANCE AND FUNDING

The following is a summary of programs relating to nonpoint source responsibilities in that they address nonpoint source pollution through activities such as assessment, demonstration, education, financial assistance, monitoring research, regulation and/or assistance.

A. State Programs

West Virginia Department of Agriculture - Relative to pesticide use, the West Virginia Pesticide Use and Application Program regulates the sale and use of pesticides including forestry uses. The program operates under the authority of the Pesticide Act of 1961 and the Pesticide Use and Application Act of 1975. The program is administered by the West Virginia Department of Agriculture under a cooperative agreement with the US EPA. A comprehensive plan for applicator certification and inspection enforcement exists. The certification program is administered in cooperation with the West Virginia University Extension Service.

West Virginia Division of Natural Resources (WVDNR) - Responsibility of the West Virginia Division of Natural Resources entails the wise use of our natural resources, including game and fish, along with enforcement of conservation laws and informing and educating the public about the goals. It also includes natural resources related planning and research and water pollution control and abatement.

West Virginia Forestry Association - This association comprises membership that includes individuals, forest landowners, businesses, forest industries, companies and state and federal agency people generally representing the forest community. This association encourages and promotes better forest land management, improved fire protection and suppression, true conservation, and utilization of West Virginia• s woodland resource. Additionally, it has developed an educational program that arouses public support and awareness of a conservation program including the multiple-use of forests, development of natural resources, application of sound land management, the development of our increasing wildlife and recreational values and encourages the wise and economical use of the resource.

West Virginia Cooperative Extension Service(WVCES) - The West Virginia Cooperative Extension Service facilitates the implementation of recommended agricultural and forestry practices that are derived from West Virginia University and other institutional research centers. This technology transfer is achieved through education and demonstration programs conducted at the local level. A variety of subjects related to nonpoint source pollution are offered including forest water quality educational activities along with pesticide applicator training and pesticide impact assessment conducted to monitor and evaluate the use of pesticides in West Virginia.

The extension forester and county agents provide leadership in establishing forestry demonstrations for the information and guidance for farmers, 4-H clubs, communities and other organizations. The cooperative Extension Service is helpful and instrumental in getting forestry projects underway. It also conducts tours of properties where soil, forest and game conservation measures are well established and which serve as excellent demonstrations. The WV Division of Forestry encourages and assists the extension forester and county agents in these activities.

West Virginia University - The West Virginia University is involved in research and teaching activities which pertain to nonpoint source pollution. The WV Division of Forestry has many research projects in progress relating to potential soil erosion from silviculture.

Soil Conservation Districts(SCD) - West Virginia SCD• s operate at the multi-county level, with the exception of the Capitol SCD of Kanawha County. Working through the WV Division of Forestry they assist with forestry programs designed to reduce soil erosion and to control sediment. Conservation education and information activities also are a part of the SCD,s. SCD personnel work through the division with landowners in developing conservation plans tailored to the individual• s forest needs. A supplemental memorandum of understanding between the Soil Conservation Districts and the WV Division of Forestry stipulates that the division can provide each district with technical services to fulfil its objectives and programs.

B. Federal Programs

Farm Service Agency(FSA) - The Farm Service Agency provides cost-share assistance to agricultural and forest producers to install conservation practices through the Stewardship Incentive Program. The Farm Service Agency county committees, consisting of three elected farmers, set project priorities, review assistance applications and determine eligibility of individual land conservation practices for federal cost-share funds. Funds are allocated to all counties on an annual basis.

Natural Resource Conservation Service(NRCS) - The mission of the Natural Resource Conservation Service includes soil and water conservation, natural resource surveys and community resource protection and development. NRCS staff located in each of West Virginia• s counties provide technical assistance to individuals, organizations and communities. Farm plans prepared by the technicians of the NRCS for cooperators are regarded as basic and essential for the WV Division of Forestry• s forest management program. Service foresters assist NRCS with the development of the plan as it pertains to the forestry phase.

VI. Appendices

FORESTRY
BEST MANAGEMENT PRACTICES
AND DEFINITIONS

FOREST STEWARDSHIP: The wise management and use of forest resources to ensure their health and productivity for now and in the future in a way that will result in social, environmental, and economic gains to the owner and the State while preventing needless destruction, neglect, and depletion of those resources. (Leaving the land and the forest resource as good as or better than we found it.)

RECLAMATION: The act of returning the land to near its original state. It is an on-going operational process of the logging job, planned and completed by each cutting section. (Leaving the land as good as or better than we found it.)

BEST MANAGEMENT PRACTICES: Common sense soil conservation measures that reduce soil erosion and stream siltation by following three (3) major principles:

1. Plan to stay away from streams, as far as possible.
2. Plan to minimize the amount of soil disturbed.
3. Plan to control water in small amounts.

STREAMS: Perennial - Identified by well-defined banks and natural channels and have continuously flowing water most years. They are usually shown on a topographic map as solid blue lines.

Intermittent - Have well-defined banks and natural channels, but typically have flowing water from a headwater source for only a portion of the year. They are usually shown on a topographic map as broken blue lines.

Ephemeral - A flow as a result of wet weather conditions when the ground is saturated. The channel is characterized by being free of leaf litter showing bare rock or soil that has been exposed by flowing water. Not shown on topographic maps.

FILTERSTRIP: Protective strip of undisturbed forest soil between a truck haul road, trail, or landing and a stream which traps sediment and other debris that may be suspended in water draining from the exposed soil surface. Heavy equipment should not be allowed in these areas so as to lessen soil compaction, disturbance, or exposure. The minimum width of a filterstrip is 100' slope distance from streambank to toe of fill or lower edge of exposed soil on each side of perennial streams and intermittent streams and 25' on each side of ephemeral streams.

TRUCK HAUL ROAD: Constructed under a 10% grade and only up to 15% grade for no more than 200'. A minimum road surface of 12' on cut (not fill). Loaded trucks should be able to negotiate safely with a reasonable speed.

LANDING: A place where trees are skidded to and bucked into logs. Logs are accumulated, sorted, and perhaps scaled prior to loading and hauling by truck to market. They should be no larger than 1/4 - 1/2 acre in size, out of the filterstrip, with all roads and trails having a gentle slope up to them.

SKID ROAD OR TRAIL: A road for use by wheeled skidders or tractors to move trees and logs from the cutting area to a landing. They should be constructed less than 15% grade, but can be up to 20% for short distances and up to 40%, if soil is not exposed. Skid roads are generally planned to be about 300' apart.

MULCH: Hay or straw mulch can be used as a temporary soil erosion measure and to improve aesthetics. Mulch should be applied as soon as possible after the soil has been exposed on road fills and landing fills when in the filterstrip or on any soil disturbed near a public road.

GRAVEL: Can be used to curb soil erosion, reduce mud carried onto public highways, and increase aesthetic value. Truck haul roads should be graveled up to 200' from public highways and 100' each side of any stream crossing (ford). Gravel 25' each side of culverted stream crossings, on all broad-based dips, and on all haul roads within the filterstrip.

FILTER OR SILT FENCE: A woven barrier to protect the stream from siltation. Always dig in bottom with flap turned uphill and covered. (36" X 100' roll with eleven 40" wood stakes $43)

HAY OR STRAW STAKED: Used as a barrier to protect stream from siltation. Can be used as mulch when the reclamation work is completed and trapped silt is brought back inside the disturbed area.

TERRA MAT: Manufactured truck tire side walls and treads into a mat that acts as a road base instead of using gravel. Works well when crossing meadows or fields.

TYPAR - MIRAFI - UNDER LAMENT: Strong fabric mat placed under gravel in road construction - worth the cost when building truck haul roads! (12 1/2' wide 432' long roll covering 600 square yards $370)

WATER DIVERSION ENERGY DISSIPATOR: Used below culvert or pipe. Constructed of baled hay or straw, rip-rap rocks, large rocks, etc. that will keep the fill and road from being undermined by flowing water.

SLASH COVER: The debris left after logging. Tree tops and downed brush should be cut back (lopped) to about 3'-4' in height. It can be used on steep skid roads and trail surfaces and on road and landing fills as mulch, if the landowner approves.

LIME: Should be used to insure first year and continued lush grass growth on dry sites and areas where sub-soil is exposed. Should be used in conjunction with fertilizing and seeding.

FERTILIZER: Will usually insure the first year lush grass growth on nearly any site. Should be used in conjunction with liming and seeding.

SEEDING: Grass seed applied at specified rates improves the aesthetics of the job, improves the wildlife habitat, and, by providing quick ground cover, will prevent soil erosion and sedimentation of the streams. Usually requires liming and fertilizing prior to or in conjunction with the seeding.

SEED BED: All areas of compacted soil should have soil scarified by disking and harrowing to loosen up the top 2 - 3" of soil prior to seeding.

DAY LIGHTING: Cut back (20' to 30') standing trees away from heavy continuous use truck haul roads to hasten drying of road surface. Removing the crown canopy can increase sheet erosion of the exposed soil. Gravel, lime, fertilizer, seed, mulch, correct grade, out-slope/in-slope, crown, cross drainage, etc. will have to be used to minimize this impact.

CULVERT: Metal, plastic, concrete, gas transmission line pipe, etc. 15" minimum diameter recommended and 25' length minimum on haul roads; 20' length on skid roads should be used for side ditch cross drainage and stream flow crossings. For side ditching the culvert spacing is determined by spacing chart, page 22 BMP booklet. The diameter of stream flow culverts is determined by area of drainage. (See size chart, page 24 BMP booklet)

OPEN-TOP PIPE CULVERT: An eight to ten inch steel wall pipe with 3-inch wide slots cut 24" long along the pipe. Used to intercept water on roads exceeding 10% slope where broad-based dips are impractical.

WOOD CULVERT (OPEN TOP): A three-sided wooden trough with cross braces, usually made from 2" X 8" or 2" X 10" rough sawn timber and installed at a 30^{o} to 40^{o} angle down-

grade and flush with the road surface to intercept and divert small sources of water from road surface. Should be spaced about 100' apart or less.
CAUTION: These require constant cleaning and are high maintenance.
GAS LINE PIPE: Used to drain seeps, small drainages and streams. When using two different sizes of pipe or culvert to provide drainage, always use the smaller diameter at the up-stream side of the fill. (Remove when no longer needed.)
LOG CROSSING: Poles and logs placed in a ravine or drainage without any soil cover. Will work on small ravines where only a few trips of the skidder and/or dozer are required. (Remove when no longer needed.) Use with caution.
CULVERT HEADER - HEAD WALL: Built to keep road fill from plugging up the upper end of the culvert. Will assist in keeping culvert open, the fill and road from washing away and the culvert from being crushed.
BRIDGES: Expensive to build, but may be the only solution. A longer road or purchased right-of-way might be less expense. (Install at right angles to the stream.) (Gravel 100' each side.)
STREAM FORD: Use only as a last resort on truck haul roads. Gravel 100' on each side of stream, and cross at right angles. Should only be used when creek bed has rock bottom.
CORDUROY ROAD: Use of planks, poles, logs, and lumber to build an over-land bridge through soft, wet areas rather than the use of several tons of gravel. (Use where wet lands have to be crossed with minimum disturbance.)
BROAD - BASED DRAINAGE DIP: An earthen water control structure constructed in road beds in such a way that vehicles can traverse them. They intercept and divert water from road surfaces. Usually requires about 20 tons of gravel in the 3% reverse grade 2% to 3% out-sloped structure. (Do not place further than 150' apart. Preferable spacing should be 100' apart.)
WATER TURN OUT - GRADE BREAK: A change in road or trail grade, abrupt or gradual and out-sloped, which collects and diverts water from exposed soil surfaces. (Should be 100' apart or less.)
DIVERSION DITCH: Any ditch or trench dug to divert water from an area where it is not wanted (upper side of landings, truck haul roads, and skid trails.)
IN-SLOPED ROAD: A road slightly sloped (1% to 3%) in toward the bank. An inside ditch will be required to carry surface run off. Cross road drainage structures (culverts) will be required (15" diameter and 25' length minimum on haul roads and 20' length minimum on skid roads). Place 100' to 150' apart and at a 30• to 45• angle with the road.
OUT-SLOPED ROAD, TRAIL, AND LANDING: An exposed soil surface that is slightly canted (1% to 3%) to the fill side to permit surface water to drain off. (Keep high berm removed.)
PERMANENT WATER BAR: A water control structure constructed across a road (30• to 45•) usually from earth, to intercept and divert water from road surface. (Constructed on a permanent basis as per spacing chart on page 17 of the BMP booklet. Usually constructed at least 1 foot in depth with fill behind it at least 18" high.)
TEMPORARY WATER BAR: A temporary water control structure constructed across a road (30^{o} to 45^{o}) from earth, to temporarily intercept and direct water from a road surface. Constructed on a temporary basis 6" to 12" deep and no more than 100' apart.

STREAMSIDE MANAGEMENT ZONE: Land adjacent to perennial, intermittent and ephemeral streams and ponds or lakes requiring special attention during forestry operations. These are critical areas where nonpoint source pollutants can enter the aquatic system.
SHADE STRIP: A no-cut or light-cut area that preserves adequate shading of perennial or intermittent streams so as to stabilize and preserve the biological value of the stream.
TOPS-IN-STREAM: Directional felling should be used to minimize stream disturbance. Felled tops in streams should be pulled from the stream channel on all perennial and intermittent streams.

Chapter 7 - Resource Extraction

I. INTRODUCTION

Mission: The WVDEP mission is to use all available resources to protect and restore West Virginia's environment in concert with the needs of present and future generations. The mission of the resource extraction category offices is to provide for the enhancement, protection, and restoration of the ecological integrity of West Virginia's land, water resources, and water uses adversely affected by NPS pollution.

Background: More than two-thirds of the state's 24,282 square miles lie within the Appalachian bituminous coal area, an area rich in coal and natural gas. This area in West Virginia is acknowledged to be the most valuable fuel deposit in the US. Thirty-nine of the 55 counties in West Virginia are coal producing counties. The major economic force in West Virginia for over 100 years has been coal production with oil and natural gas resource extraction also having a major economic impact on the state. West Virginia has ranked among the top 5 states in coal production for most of the twentieth century.

Safeguards have been established through state and federal regulations that require the coal mining industry to treat and properly dispose of the by-products of the mining process. This entails properly designing all aspects of surface mining to control sediment runoff along with treatment of mine water discharging from the facility. Regulations cover the mining process from inception to completion and abandonment. Even with these regulatory safeguards pollution can still be a problem. Oil and natural gas resource extraction also is regulated through permits and inspections.

Environmental Impacts: Resource extraction nonpoint source pollution's environmental impacts include sediments produced from erosion, wastewater from mining, alkaline mine drainage, acid mine drainage and metal-laden drainage. The resources affected include agriculture, air, fish and wildlife, groundwater, surface water, land, soils, vegetation, human quality of life and water usage.

II. STATEWIDE PROGRAMS TO ADDRESS RESOURCE EXTRACTION CATEGORY NPS POLLUTION

The existing statewide programs available to address resource extraction category NPS pollution include a combination of water quality based and technology based programs and a diversity of regulatory, non-regulatory, and financial and technical assistance programs designed to achieve, maintain, and sustain designated and beneficial water uses. The goals of these programs are to treat, abate, control, and prevent resource extraction category NPS pollution.

Coal Mining Pollution

Currently two federal and state programs regulate the principal environmental

impacts of the coal mining industry. The Federal Clean Water Act (CWA), which is administered by the EPA, regulates the discharge of wastewater from coal mines, preparation plants, and associated areas through the National Pollution Discharge Elimination System (NPDES). The federal Surface Mining Control and Reclamation Act of 1977 (SMCRA) administered by the Office of Surface Mining also regulates the coal mining industry but covers a breadth of regulated activities greater than the Clean Water Act. Not only does SMCRA regulate coal mining activities such as reclamation and revegetation of disturbed land, blasting and subsidence, but SMCRA also regulates the hydrological consequences of the mining operation, including the discharge of wastewater from the mining activity.

Both federal statutes allow states to receive authorization from the federal government to implement the federal programs. The State of West Virginia has received such authorization for both the NPDES and SMCRA programs.

The OM&R administers the NPDES Program and SMCRA Program.

Any mine in operation since August 3, 1977, that is left abandoned and unreclaimed is a nonpoint source that is subject to the bond forfeiture program in West Virginia.

The bond forfeiture program is a self-supporting program mandated to reclaim lands where permittees failed to satisfactorily reclaim under conditions of the permits. Funding for the program comes from the forfeiture of performance bonds posted as a part of the permit requirements. Supplemental funds are derived from a special three-cent-per-ton tax levied on all coal produced within the state. This tax is collected only when the fund drops below one million dollars, and it is not collected after the fund grows to two million dollars. The program is carried out primarily through construction contracts awarded to successful bidders on individual projects. Some work is accomplished by the program staff.

Currently, means exist to address some of the problems caused by abandoned mines through the Abandoned Mine Lands (AML) Program. Title IV of the Surface Mining Control and Reclamation (Public Law 95-87) is designed to help reclaim and restore coal mine areas abandoned prior to August 3, 1977, throughout the country. It is an especially important law in West Virginia, where most of the state's 55 counties have abandoned mine lands within their boundaries. Almost 95% of West Virginia's extractable minerals is coal. The AML Program supplements existing state programs and allows the State of West Virginia to correct many abandoned mine related problems that would otherwise not be addressed.

The major purpose of the AML Program is to reclaim and restore abandoned mine areas so as to protect the health, safety, and general welfare of the public and the environment. The first priority is the protection of pubic health, safety, general welfare, and property from extreme danger resulting from past coal mining conditions. These

conditions include unsafe refuse piles, treacherous highwalls, pollution of domestic water supplies from mine drainage, mine fires, subsidence and other problems.

The AML Program is now also focused on treating and abating water quality problems associated with abandoned mine lands. By recognizing the need to protect and in many cases improve the quality of the state's water resources from the impacts of drainage from abandoned coal mines, coordinated efforts are now being employed to deal with this NPS problem.

The OAML&R administers the AML and Bond Forfeiture Programs.

Programs to Encourage and Fund Abandoned Mine Land Reclamation

Initiatives to clean-up land and water resources from resource extraction category NPS pollution have been created, developed, and implemented in West Virginia since 1990. Improved mining techniques and regulations allow and encourage industry to restore previously mined areas through remining and reclamation of abandoned mine lands. Mine permits now involve remining and the reclamation of abandoned mine lands as a more cost-effective way to mine coal and reclaim lands. Underground mine coal wastes and refuse piles are being removed and in some cases utilized as a fuel source in cogeneration electric power plants.

Many stakeholders are working together to address abandoned mine land NPS pollution. The WVDEP (Office of Abandoned Mine Lands and Reclamation, Office of Mining and Reclamation, Office of Oil and Gas, Office of Water Resources), WV Soil Conservation Agency, WV Division Of Forestry, WV Division of Natural Resources, Natural Resources Conservation Service, Environmental Protection Agency, Office of Surface Mining, United States Geological Service, Watershed Network, Watershed Associations, and the Public are now working in concert to address abandoned mine land NPS pollution.

The most cost-effective and successful protection and restoration projects have resulted from partnerships. These partnerships have been assisted and encouraged by the implementation of low-cost treatment and abatement alternatives with the greatest and most sustainable benefits to designated water uses.

This concept:

- Encourages stakeholder participation in abandoned mine land reclamation and NPS pollution treatment, abatement, and prevention;

- Improves efficiency through better communication and coordination between the stakeholders;

- Increases reclamation through reduction of remining risks; and

- Leverages and maximizes funding through the expansion of existing resources and exploring new ones.

Abandoned Mine Land Fund

The Abandoned Mine Land Fund is derived from coal operator fees paid on tons of coal mined. The fees are 35 cents per ton of surface coal mined and 15 cents per ton on underground coal mined. Yearly grant amounts vary depending on Congressional appropriations. West Virginia's grants through the 1990's have ranged from $15 to $25 million per year. The Fund has enabled West Virginia to reclaim thousands of acres of abandoned mine lands, and many miles of streams clogged by mine sediment or severely impacted and degraded by polluted coal mine drainage have been restored. The Fund has paid for closing and backfilling mine openings and open mine pits, including highwalls, refuse pile stabilization, preventing infiltration into underground mine workings, extinguishing or stopping the advance of mine related fires, emergencies, and water treatment supplies and distribution systems.

Historically, the Office of Surface Mining required that abandoned mine lands reclamation was performed in a priority fashion. Health, safety, and general welfare were considered Priorities 1 and 2. Polluted coal mine drainage from abandoned mine lands was defined as a Priority 3 and did not receive much attention or funding through the Fund. The Office of Surface Mining recently authorized polluted coal mine drainage problems to be funded in conjunction with traditional reclamation Priorities, if it can be justified and demonstrated that the water quality problems pose health, safety, and general welfare issues to communities. The goal is to clean-up abandoned polluted coal mine drainage NPS pollution utilizing a Holistic Watershed Approach while generating benefits to the water resources and local economies.

Acid Mine Drainage Treatment and Abatement Program and Fund (Ten% Set-Aside)

In 1990, SMCRA was amended to include a provision allowing states and tribes to establish an Acid Mine Drainage Treatment and Abatement Program and Fund. States and tribes may set-aside up to 10% of their annual grant to begin to address abandoned polluted coal mine drainage problems utilizing a comprehensive Holistic Watershed Approach.

Money from the Acid Mine Drainage Treatment and Abatement Fund can be utilized to clean-up abandoned polluted coal mine drainage at sites where mining ceased prior to August 3, 1977, and where no continuing reclamation responsibility can be determined. In order to qualify and be eligible, qualified hydrologic units or watersheds must be identified and water quality must adversely impact biological resources. A plan must be prepared and presented to the Natural Resources Conservation Service for review and the Office of Surface Mining for approval. Plans that include the most cost-effective treatment and abatement alternatives, the greatest down-stream benefits to the ecosystem, and diverse cooperators and stakeholders, will be the highest priority for approval.

The Acid Mine Drainage Treatment and Abatement Program and Fund is administered by the OAML&R.

Appalachian Clean Streams Initiative

The Appalachian Clean Streams Initiative (ACSI) was created in 1995 by the Office of Surface Mining as a regional partnership of federal, state, and local, government; industry; watershed associations; university researchers; and individuals interested in the clean-up of water resources impacted by abandoned polluted coal mine drainage. ACSI provides an opportunity for partnerships, coordination, pooling technical and financial resources, and sustainable results. West Virginia has received approximately $1 million per year since the inception of the ACSI and has focused restoration projects in four watersheds.

The ACSI is administered by the OAML&R.

Appalachian Clean Streams Initiative Watershed Cooperative Agreement Program

The ACSI Watershed Cooperative Agreement Program (WCAP) was created in 1999 as an effort to foster and support watershed associations and non-profit organizations interested in cleaning up water resources adversely affected by abandoned mine land NPS pollution. The WCAP offers $5,000 to $80,000 grants to groups in need of additional funding to enable abandoned polluted coal mine drainage treatment and abatement projects to go to construction. West Virginia has received approximately $160,000 since the inception of the WCAP to support two watershed association's efforts in abandoned polluted coal mine drainage clean-up. The primary focus of WCAP is to create new stakeholders to jointly address abandoned polluted coal mine drainage.

The WCAP is administered by the OAML&R.

Abandoned Mine Land and Reclamation Holistic Watershed Approach and Acid Mine Drainage Abatement Policy

Holistic Watershed Approach:

The Holistic Watershed Approach was created and implemented as a framework for integrated sampling to support watershed characterizations. This Approach was designed to involve many diverse stakeholders in gathering, collecting, and interpreting biological, chemical, and physical environmental water quality data for the purpose of implementing protection and restoration projects to clean-up abandoned polluted coal mine drainage on a watershed basis.

A Holistic Watershed Approach Protocol was developed and implemented, with great success, for the purpose of providing a step-by-step process to guide each of the stakeholders from planning…to data gathering and collection…to implementation…to operations, maintenance, and monitoring for effectiveness.

This Holistic Watershed Approach augments and complements the Watershed Management Framework and provides more environmental information and data to begin to make more informed decisions as to where we invest our resources.

The goals of the Holistic Watershed Approach are to:

- Foster partnerships and develop stakeholders interested in protection and restoration;

- Develop long-term funding commitments to support long-term planning, implementation, and funding;

- Promote a Holistic Approach to watershed planning that results in the protection and restoration of entire watersheds;

- Encourage development and utilization of new and innovative treatment and abatement technologies that reduce costs and increase benefits; and

- Coordinate the activities of other programs and other pollution problems so that all the stakeholders and partners are encouraged to participate.

Acid Mine Drainage Abatement Policy:

The Acid Mine Drainage Abatement Policy was created within the OAML&R to guide future efforts in treating and abating acid mine drainage. The OAML&R has been actively involved in the successful remediation of acid mine drainage, however insufficient funding disables the clean-up of all known problems. The Policy acts to guide the efforts of the OAML&R to expend funds in order to achieve the maximum amount of acid mine drainage treatment within the boundaries imposed by budgetary and statutory constraints. The goal is to utilize existing technologies and practical economic considerations to maximize the amount of treatment for dollars expended.

Treatment and Abatement Options for Abandoned Polluted Coal Mine Drainage and Methods for Determining Best Application of the Options

The assessment of polluted coal mine drainage sites for possible treatment and abatement systems involves analyzing five basic criteria: water chemistry, flow rate, available land, water use benefits, and funding resources. A description of treatment and abatement options is presented as an Appendix.

When determining the best application of the treatment and abatement options, a method of comparing certain concentrations of a pollutant with flow and available land must be adhered to for the purpose of designing the right treatment for the problem. The method for making this determination is presented as an Appendix.

Treatment and Prevention of Resource Extraction Category NPS Pollution

1. Mines and Minerals Group

The Mines and Minerals Group was created in December 1999 by the WVDEP Director in order to increase the efficiency and reduce duplication in state government. This was done because both the OAML&R and OM&R deal with mining and reclamation. This Group has been institutionalized under the auspices and management of one Chief. The OM&R will continue to address the active and proposed mining operation and the reclamation of these sites. The OAML&R will continue to address the pre-1977 mining sites and the reclamation of these sites. This will also enable a closer study of reclamation and water treatment practices.

Office of Abandoned Mine Lands and Reclamation

Overall Goal

To protect the public health, safety, and property from past coal mining practices and enhance the environment through reclamation and restoration of land and water resources.

Background

The Office of Abandoned Mine Lands and Reclamation (OAML&R) protects the environment while administering the processes necessary for the development and implementation of abandoned mine land reclamation practices and water treatment within West Virginia's extractable mineral resource regions.

The OAML&R is charged to reclaim mine lands abandoned prior to August 1977. Abandoned mine land related problems such as old buildings, mine portals, highwalls, burning and non-burning refuse piles, polluted coal mine drainage, mine fires, and subsidence remain and continue to adversely affect the environment and impede public health and safety.

The OAML&R corrects these abandoned mine-related problems as Priorities and as is specified in Public Law 95-87, Section 403 (a), 1-3.

The Priorities are:

- The protection of public health, safety, general welfare, and property from extreme danger of adverse effects related to coal mining practices;

- The protection of public health, safety, and general welfare from adverse effects related to coal mining practices; and

- The restoration of the environment, including the land and water resources, that were degraded by adverse effects related to coal mining practices. This involves the conservation and development of soil, water (not channelization), woodland, fish and wildlife, recreational resources, and agricultural productivity.

Another program focus, as specified in Public Law 95-87, Section 403 (b), is Utilities and Other Facilities. This allows up to 30 % of West Virginia's grant to be utilized for the purpose of protecting, repairing, constructing, or enhancing facilities relating to water supply, including water distribution facilities and treatment plants, and to replace water supplies adversely affected by coal mining-related practices prior to August 3, 1977.

OAML&R's responsibilities include many diverse functions, both with the office staff and the field staff these functions include:

- Planning projects based on Priorities and available funding;
- Determining land owners and gaining access to property;
- Environmental data collection for the purpose of designing and constructing the appropriate reclamation practices and water treatment alternatives;
- Designing and oversight of constructing projects;
- Continuously monitoring all activities associated with abandoned mine land reclamation activities, project effectiveness, surface water, and groundwater systems to ensure protection of the environment and control of water pollution.

The Office upholds the responsibility within the state to work to maintain the quality and integrity of West Virginia's land and water resources while safeguarding the environment.

The OAML&R houses two Programs:

Abandoned Mine Lands Program

The Abandoned Mine Lands Program is federally funded and receives approval from and reports to the Office of Surface Mining. Grant funding is derived from fees paid by coal operators on tons of coal mined.

Special Reclamation (SR) Program

The Special Reclamation Program is state-supported and funding is derived from a three-cents-per-ton tax on coal mined in West Virginia, the forfeiture of bonds, and assessments and civil penalties.

The OAML&R is divided into units that complement and work to carry out the mission of the program.

Organizational Units:

- Planning - Selects and develops abandoned mine lands projects based on Priorities for land reclamation and water resources restoration and treatment. Projects include tentative cost estimates, status of eligibility, and detailed site and problem descriptions. Environmental Assessments, as a part of National Environmental Policy Act requirements, and Problem Area Data Sheets are developed and submitted with the state's grant application to the Office of Surface Mining for review and approval.

- Stream Restoration - As a part of the Planning Unit, performs literature and historical data searches, field reconnaissance, and monitors surface water and ground water quality and quantity associated with abandoned mine lands. The OAML&R's Acid Mine Drainage Abatement Policy is implemented to ensure that successful projects are selected and implemented which are cost-effective. Coordinates and develops pre-construction reports to satisfy specified design criteria utilized for polluted coal mine drainage treatment and abatement projects, as well as post-construction reports to determine operations and maintenance plans and measure the environmental benefits of the projects. Also coordinates the OAML&R's Acid Mine Drainage Treatment and Abatement Program (10% Set-Aside) for polluted coal mine drainage through a Holistic Watershed Approach.

- Stream Partners - West Virginia's Division of Environmental Protection, Division of Forestry, Division of Natural Resources, and Soil Conservation Agency jointly administer the Program. Mini-grants are made available to Watershed Associations to support group's organization and operations and watershed improvement projects that enhance, protect, and restore the environment. The Program works to foster the growing and building of partnerships throughout the state, as well as provide outreach and education about environmental issues.

- Realty - Determines surface land ownership of all real property associated with abandoned mine land projects. Rights-of-Entry agreements are negotiated and acquired from property owners and lessees granting permission for exploration, design, construction, and reclamation activities. In addition, property appraisal opinions are prepared to determine if project results in an increase in property market value.

- Design - Provides two types of design services through Contract Consultant Design and In-House Design. The Contract Consultant coordinates design on the larger, more technically difficult, and more expensive abandoned mine land reclamation projects. Develops plan for what work is to be done, who will perform the work**,** and when will work be done. Specific functions are: surveys and mapping; geotechnical investigations; and contract consulting. Once designs are ready and approved, the Department of Administration coordinates bidding process and award of contracts.

In-House coordinates design on the smaller, less technically difficult, and less expensive abandoned mine land reclamation projects. Develops plan for what work is to be done, who will perform the work, and when work will be done. The specific function is in-house consulting. Once designs are ready and approved, the Department of Administration coordinates bidding process and award of contracts.

- Construction - Provides oversight and inspection of project construction to ensure compliance with plans and specifications. Projects are monitored for effectiveness for five years after implementation. Any operations and maintenance after project completion is contracted and inspected by the OAML&R.

- Emergencies - Provides immediate action and response to abandoned mine land sites threatening public health, safety, general welfare, and property. Responsible for addressing problems that occur suddenly. Performs project development and provides plans, specifications, designs, bid coordination, and construction in an expeditious fashion to abate problems in a timely manner. Operations and maintenance is performed for five years as necessary.

- Special Reclamation - Coordinates land reclamation and water treatment at mining sites where performance bonds have been forfeited and revoked by the OM&R. Reclamation and water treatment is performed as specified in the original permit reclamation plan. After determining liabilities and water treatment and reclamation requirements, bids are reviewed and a contract is awarded to the lowest bidder.

The laws and regulations that govern the OAML&R are:

- Title IV of the Surface Mining Control and Reclamation Act of 1977;

- Public Law 95-87, Section 403 (a), 1-3;

- Chapter 22, Code of West Virginia, Division of Environmental Protection;

- Chapter 22, Article 1, Section 14, Code of West Virginia, Stream Restoration Fund and Program;

- 30 CFR, Chapter VII, Subchapter R, Part 876, Acid Mine Drainage Treatment and Abatement Program and Fund;

- 40 CFR, Code of Federal Regulations;

- Chapter 20, Article 13, Code of West Virginia, Stream Partners Program and Fund; and

- Chapter 60, Article 4, Awarding of Stream Partners Grants Rules.

Office of Mining and Reclamation

Overall Goal

To regulate the coal industry and mineral extraction, in accordance with federal and state laws, to protect the environment and public health.

Background

The Office upholds the responsibility within the state to work with industry to maintain the quality and integrity of West Virginia's extractable mineral resources while safeguarding the environment.

The OM&R is responsible for monitoring and regulating all activities associated with issuing and renewing permits for mineral extraction sites and related facilities; inspecting facilities for compliance; monitoring surface water and groundwater quality; tracking ownership and control; and issuing and assessing violations.

The OM&R's responsibilities include many diverse functions, both with the office staff and the inspector corps or field staff which include:

- Issuing permits for all surface and underground coal mines, preparation plants, coal loading facilities, and haulageways;
- Issuing all non-coal mineral extraction permits (i.e., sand, limestone);
- Issuing and enforcing NPDES permits on mineral extraction to protect surface water and groundwater quality;
- Continuously monitoring all activities associated with mineral extraction activities;
- Enforcing state and federal laws and regulations;
- Working to ensure the safety of coal related dams and impoundments; and
- Monitoring surface water and groundwater systems to protect the environment and control water pollution.

The OM&R is divided into units that complement and work to carry out the mission of the program.

Organizational Units:

- Permitting - Technical staff that includes geologists, hydrologists, engineers, and others who review all mineral extraction permit applications submitted for approval to ensure compliance with laws and regulations.

- Hydrologic Protection - Issues NPDES permits to mineral extraction facilities to ensure compliance with the applicable laws and regulations to protect surface water and groundwater resources. This unit also issues groundwater protection plans to industry to ensure protection of groundwater systems.

- Inspection and Enforcement - Enforces continued compliance with regulations and laws through routine inspections of all mineral extraction permits. Inspectors have the authority to temporarily cease mining activities when a situation occurs that poses a risk of imminent harm to human life and the environment.

- Ownership and Control - Determines and verifies owners and controllers of all active and forfeited mineral extraction permits, as well as, reviewing current or new permits to determine owners and controllers. An Applicant Violator System is also maintained and utilized.

- Assessment - Assesses the facts of a violation and determines the amount of penalty for each violation written.

The laws and regulations, which govern the OM&R and the industry, are:

- Title V of the Surface Mining Control and Reclamation Act of 1977;

- Chapter 22, Article 3, West Virginia Surface Coal Mining and Reclamation Act;

- Title 38, CSR 2, Section 1-22, West Virginia Surface Mining Reclamation Regulations;

- Code of West Virginia, Chapter 22, Articles 1, 4, 11, 12, 13 and 14; Chapter 22B, Article 1);
- West Virginia Hydrologic Protection Regulations;

- Title 38, Series 2F, Groundwater Protection Regulations;

- Title 46, Series 1, Water Quality Standard Regulations;

- Title 46, Series 12, Groundwater Standards Regulations;

- Title 47, Series 10, Non-Coal NPDES Regulations;

- Title 47, Series 30, Coal NPDES Regulations;

- Chapter 22, Code of West Virginia, Division of Environmental Protection; and
- 40 CFR, Code of Federal Regulations.

Office of Oil and Gas

Overall Goal

To protect West Virginia's environment while industry efficiently produces oil and natural gas.

Background

The Office of Oil and Gas (OO&G) protects the environment while administering the processes necessary for the development and enhancement of West Virginia's oil and natural gas reserves.

The OO&G is responsible for monitoring and regulating all activities associated with exploration, drilling, storage, production, and development of the state's oil and natural gas resources.

The OO&G's responsibilities include many diverse functions, both with the office staff and the inspector corps or field staff these functions include:

- Permitting;
- Regulatory Assistance and Compliance;
- Abandoned and Orphaned Wells;
- Well Plugging;
- Conservation; and
- Inspection and Enforcement.

The office staff handles processing and filing permits, recording production of active wells, logging transactions including transfers and bonds, and responding to inquiries and complaints. This important function provides historic data on wells in the state, and is provided, upon request, to both citizens and industry.

The inspector corps or field staff is assigned a territory of responsibility within the state to maintain the quality and integrity of West Virginia's oil and natural gas resources while safeguarding the environment.

The field staff:

- Oversees drilling activities of new wells;
- Conducts field reviews of applications for well work permits;
- Regulates plugging of non-producing wells;
- Oversees oil spill clean-up;
- Performs compliance inspections on existing wells;
- Responds to citizen complaints;
- Locate, evaluate, and plug abandoned and orphaned wells;
- Performs inspections on underground injection control wells;
- Provides training seminars for well operators and the public; and
- Assists office staff.

Together, the office staff and field staff:

- Maintains records on more than 40,000 active and more than 25,000 inactive oil and gas wells;
- Manages the Abandoned and Orphaned Well Plugging and Reclamation Program;
- Helps to ensure that surface water and ground water systems are protected from oil and gas well activities; and
- Administers the laws and ensures that the laws are adhered to by industry.

The laws and regulations that govern the OO&G and the industry are:

- 35CSR1, Miscellaneous Water Pollution;
- 35CSR2, Oil and Gas Operations – Solid Waste Rule;
- 35CSR3, Coalbed Methane Wells Rule;
- 35CSR4, Oil and Gas Wells and Other Wells;

- 35CSR5, Designation of Future Use and Inactive Status for Oil and Gas Wells;
- 35CSR6, Abandoned Wells;
- West Virginia State Code, Chapter 22, Section 6;
- Chapter 22, Code of West Virginia, Division of Environmental Protection; and
- 40 CFR, Code of Federal Regulations.

Stream Restoration Group

The Stream Restoration Group not only provides services to the OAML&R, but also the OM&R.

This Group has developed a Holistic Watershed Approach Protocol to provide integrated sampling to support watershed characterizations that leads to protection and restoration projects. The result is more environmental data for more informed decision-making as to where we invest our resources to generate the greatest and most cost-effective benefits.

This Holistic Watershed Approach is designed to coordinate the most comprehensive approach to address environmental problems on a watershed basis with all potential stakeholders.

The Holistic Watershed Approach has been design and implemented to augment and complement the OAML&R's and OMR's missions, as well as TMDLs, Watershed Assessment Program, Watershed Management Framework, and a stakeholder process.

This Group also provide hands-on outreach, education, and training to volunteers and stakeholders that participate in integrated sampling for watershed characterizations.

West Virginia's Stream Partners Program

The West Virginia Stream Partners Program was created in March of 1996 to provide seed-grants to Watershed Associations implementing watershed improvement projects that enhance, protect, and restore the environment.

It was realized that when citizens work in concert with government agencies and other stakeholders to solve environmental problems, significant and sustainable benefits are received.

West Virginia's Division of Environmental Protection, Division of Forestry, Division of Natural Resources, and Soil Conservation Agency jointly administer the Program. The Legislature annually appropriates $100,000 to make the seed-grants.

The OAML&R provides staff to coordinate the Program statewide. The Program, to date, has funded 80 Watershed Associations working to enhance, protect, and restore West Virginia watersheds.

West Virginia Watershed Network

The West Virginia Watershed Network was formed in conjunction with the creation of the Stream Partners Program to provide a forum for Watershed Associations, stakeholders, and government agencies to begin to communicate, collaborate, and coordinate watershed resource activities which involve the protection and restoration of land and water resources.

The Network offers outreach, education, technical and financial assistance, training, and resources for implementation of watershed improvement projects and institutionalization of the watershed approach concept.

West Virginia Watershed Management Framework

The Watershed Management Framework is a collaborative effort of multi-level stakeholders that pool the resources necessary to begin to address NPS pollution on a watershed basis. The Framework works to provide management strategies for communication and cooperation among the stakeholders when working in watersheds. Each Hydrologic Region and Watershed is targeted within a revolving five year cycle.

The Framework focuses on improving public awareness, understanding, and involvement; improving program efficiency; increasing program effectiveness and cost-effectiveness; and improving information and data management.

III. WEST VIRGINIA'S RESOURCE EXTRACTION CATEGORY NPS STRATEGY

West Virginia's Resource Extraction Category NPS Strategy is based in part on the mission of the West Virginia Division of Environmental Protection (WVDEP) and the programs within the resource extraction category offices, Mine and Minerals Group and the Office of Oil and Gas.

The Strategy includes short-term objectives (5 years or less) and long-term goals (more than 5 years) to establish flexible, targeted, iterative approaches to achieve, maintain, and sustain designated and beneficial uses of the waters of West Virginia.

The Strategy is supported by the following program elements to carryout the Resource Extraction Category functions when addressing NPS pollution.

NPS Coordinating Review Board

The NPS Coordinating Review Board (CRB) includes representation from the Division of Forestry; Soil Conservation Agency; Natural Resources Conservation Service; EPA's NPS Project Office; and the WVDEP's OAML&R; Office of Environmental Advocate and the WVDEP Office of Water Resources' Ground Water Program and NPS Program. The NPS CRB provides input into the NPS Program and is responsible primarily for grant allocation and project development and implementation.

The NPS CRB believes and shares in the vision that when government agencies and the public work together to prioritize programs and projects to jointly address NPS pollution, water quality standards can be achieved to support designated and beneficial uses of all surface water and ground water systems.

West Virginia's Holistic Watershed Approach and Watershed Management Framework

The Resource Extraction Category NPS Program addresses NPS pollution through a Holistic Watershed Approach and Watershed Management Framework.

The Holistic Watershed Approach provides integrated sampling to support watershed characterizations that leads to protection and restoration projects. The result is more environmental data for more informed decision-making as to where we invest our resources to generate the greatest and most cost-effective benefits. This process augments and complements a five-year cycle.

The Watershed Management Framework is a collaborative effort of multi-level stakeholders that pool the resources necessary to begin to address NPS pollution on a watershed basis. The Framework works to provide management strategies for communication and cooperation among the stakeholders when working in watersheds. Each of the 32 Hydrologic Regions are targeted within a five-year cycle.

West Virginia's Partnerships

The partners involved through the NPS CRB, Holistic Watershed Approach, Watershed Management Framework, Stream Partners Program, Watershed Network, and the public work in concert to address NPS pollution. These Partnerships allow for broad-based inclusion in watershed protection and restoration initiatives. The core objective is to define roles, responsibilities, and expectations and to better communicate and coordinate resources and actions within West Virginia's Watersheds affected by NPS pollution. In order to make the Partnerships effective and efficient, we need to work together to provide outreach, education, and training; funding and staffing; program planning and development; and a way to improve partners' relationships.

Geographic Information Systems

The Resource Extraction Category NPS Program provides biological, chemical, and physical water quality data; spatial data; geologic data; and geographic data to the Technical Applications and Geographic Information Systems support group to ensure that GIS is accessible to all the partners to support protection and restoration initiatives.

It is anticipated that GIS will be utilized for the following: decision-making; cartography; public empowerment; modeling; prioritizing; spatial analyses; TMDLs; and measuring the environmental benefits of NPS watershed protection and restoration projects.

Total Maximum Daily Loads

The Resource Extraction Category NPS Program contributes to the development and implementation of TMDLs within streams on the Section 303 (d) List of Impaired Waters. When necessary, data and information are provided to support the development of cost-effective restoration projects and measures to begin to address TMDLs. Innovative and creative partnerships will be pursued to pool the necessary financial and technical resources to perform TMDLs implementation.

Environmental Measures and Indicators of Progress, Success, and Sustainability

The Holistic Watershed Approach and Watershed Management Framework work hand-in-hand to use Water Quality Standards to measure and indicate progress, success, and sustainability.

Water Quality Standards are a combination of water uses to be protected and the general and specific criteria, or levels of parameters, that need to be maintained or attained to prevent or eliminate pollution.

Protection and restoration projects are prioritized based on water uses impacted, benefited, and maintained.

Water use categories in West Virginia are:

Category I - Water Supply, Public;

Category II - Propagation of Fish and Other Aquatic Life;

Category III - Water Contact Recreation;

Category IV - Agriculture and Wildlife; and

Category V - Water Supply Industrial, Water Transport, Cooling, and Power.

Assessments of the biological, chemical, and physical characteristics of the water resources will also be utilized as a scientific way to measure the indicators of progress, success, and sustainability.

Measurable Environmental Results (MERs) as revealed by water quality improvements from NPS controls, load reduction, and elimination will be evaluated as a part of the assessments performed within the Watershed Management Framework through a Holistic Watershed Approach. Public outreach, education, awareness, and action will also be considered.

Water Quality Improvements:

- River and/or stream miles and lake acreage in compliance with one or more water use categories;
- Improvements in surface water and ground water quality variables;
- Improvements in biological and/or physical variables;
- Removal of fish consumption advisories; and
- Removal of streams and/or water resources from the 303 (d) List of Impaired Waters.

NPS Load Reduction:

- Reductions in pollutant loadings from NPS in impaired watersheds, priority watersheds, and source water protection areas; and
- Reduction in sediment resulting from remedial Best Management Practices (BMPs) implemented.

NPS Controls Implementation:

- BMPs in targeted watersheds;
- Technologies that re-use, reduce, and/or recycle and therefore prevent NPS pollution;
- Number of new mine permits issued incorporating remining of abandoned mine lands;
- Number of orphaned oil and gas wells plugged, reclaimed, and/or restored;
- Number of abandoned mine lands reclaimed;
- Number of polluted coal mine drainage treatment and abatement projects implemented; and
- Number of Bond Forfeiture Program sites reclaimed.
- Public Outreach, Education, Awareness, and Action:
- Participation in public/stakeholder integrated sampling for watershed characterizations;
- Provide information on BMPs, financial and technical assistance, and research and demonstration;
- Increase in the number of Watershed Associations; and
- Number of educational and technical resources made available on Resource Extraction Category NPS pollution.

IV. Action Plan to Address Resource Extraction Category NPS Challenges

This Action Plan identifies a representative list of resource extraction category NPS pollution problems to be solved, milestones as solutions, and implementation steps to be accomplished by the Resource Extraction Category NPS Program and stakeholders. The Action Plan is being implemented in conjunction with the implementation of Holistic Water Approach, Watershed Management Framework, TMDLs, and the Resource Extraction Category NPS Program. *The scheduling of project implementation and completion is based on the entities listed above and the acquisition of sufficient funding.* The time frames can vary and are difficult to predict for example the AMD treatment of the Middle Fork River, which began in 1990. Through AMD source treatments and limestone fines treatment the Middle Fork River has been restored. But, AMD source treatment projects are still being implemented, eight years later, to reduce dependence on temporary solutions such as adding limestone fines.

Long-Term Goal and Short-Term Objectives

Goal 7 – 1: By 2025, attain and support designated and beneficial water uses in watersheds affected by acid mine drainage from abandoned mine lands.

Objective 1: Prioritize projects for resource extraction category NPS pollution protection and restoration using the Section 303 (d) List of Impaired Waters, Anti-Degradation Policy, Watershed Management Framework, and Resource Extraction Category Mandates, Policies, and Programs for using a Holistic Watershed Approach. - annually

Objective 2: Participate in restoration plan development and implementation of Total Maximum Daily Loads (TMDLs) for waterbodies impacted by resource extraction category NPS pollution contained in the Section 303 (d) List of Impaired Waters. - annually

Objective 3: Full implementation of AMD treatment projects in the Paint Creek Watershed to restore 59.48 impaired stream miles to full designated uses. – 2005

Objective 4: Full implementation of the Sovern Run and Green's Run AMD treatment projects in the Lower Cheat Watershed to restore 12.9 impaired stream miles to full designated uses. – 2005

Objective 5: Dependent upon completion of TMDLs and sufficient funding, the implementation of AMD treatment projects in the Stoney River Watershed to restore 5.26 impaired stream miles. – 2012

Objective 6: Dependent upon completion of TMDLs and sufficient funding, the implementation of AMD treatment projects in the Tug Fork River Watershed to restore 174.69 impaired stream miles. – 2012

Objective 7: Dependent upon completion of TMDLs and sufficient funding, the implementation of AMD treatment projects in the Monongahela River Watershed to restore 152.72 impaired stream miles. – 2012

Objective 8: Dependent upon completion of TMDLs and sufficient funding, the implementation of AMD treatment projects in remaining Group A watersheds impacted by AMD according to the TMDL schedule (page 54) and the Watershed Management Framework (page 38 – 50) – 2015

Objective 9: Dependent upon completion of TMDLs and sufficient funding, the implementation of AMD treatment projects in remaining Group B watersheds impacted by AMD according to the TMDL schedule (page 54) and the Watershed Management Framework (page 38 – 50) – 2016

Objective 10: Dependent upon completion of TMDLs and sufficient funding, the implementation of AMD treatment projects in remaining Group C watersheds impacted by AMD according to the TMDL schedule (page 54) and the Watershed Management Framework (page 38 – 50). – 2017

Objective 11: Dependent upon completion of TMDLs and sufficient funding, the implementation of AMD treatment projects in remaining Group D watersheds impacted by AMD according to the TMDL schedule (page 54) and the Watershed Management Framework (page 38 – 50). – 2018

Objective 12: Dependent upon completion of TMDLs and sufficient funding, the implementation of AMD treatment projects in remaining Group E watersheds impacted by AMD according to the TMDL schedule (page 54) and the Watershed Management Framework (page 38 – 50). – 2019

Objective 13: Monitor and maintain AMD treatment to protect water quality in the AMD impaired streams. – 2025

Comprehensive Planning and Integrated Sampling through a Holistic Watershed Approach and Watershed Management Framework

Problem:

In West Virginia, past resource extraction category NPS pollution (from oil and gas wells and abandoned mine lands) has caused major degradation to thousands of stream miles. Comprehensive planning and integrated sampling utilizing a Holistic Watershed Approach through a Watershed Management Framework are necessary to determine the most effective actions to treat and abate resource extraction category NPS pollution and to prevent future degradation.

Goal 7 – 2: By 2010, provide information and data necessary utilizing a Holistic Watershed Approach to assist in developing watershed management plans through a

Watershed Management Framework, on a revolving five year cycle, for the protection and restoration of water resources impacted by resource extraction category NPS pollution.

Objective 1: Establish policies and procedures and create incentives to encourage business, industry, and public involvement. - 2010

Objective 2: Encourage more effective communication and coordination among local, state, and federal government agencies. - annually

Objective 3: Participate in integrated sampling for watershed characterizations in two watersheds. - 2006

Objective 4: Provide all data to the TAGIS Support Group to create and develop accurate GIS maps of resource extraction category pollution for decision-making, modeling, prioritizing, TMDLs, and measuring the environmental benefits of protection and restoration projects. - annually

Objective 5: Standardize and integrate all environmental data collection, BMPs, and treatment and abatement alternatives for resource extraction category NPS pollution. - annually

Stakeholders:

WVDEP (Mines and Minerals Group Office of Abandoned Mine Lands and Reclamation and Office of Mining and Reclamation, Office of Oil and Gas, and Office of Water Resources), WV Soil Conservation Agency, WV Division Of Forestry, WV Division of Natural Resources, Natural Resources Conservation Service, Environmental Protection Agency, Office of Surface Mining, United States Geological Survey, Watershed Network, Watershed Associations, and the Public.

Watershed Restoration/Protection Plan Implementation

Problem:

The protection and restoration of resource extraction category NPS pollution impacted watersheds is dependent upon the successful implementation of BMPs, and treatment and abatement alternatives.

Goal 7 – 3: Participate in watershed-based programs to support resource extraction category NPS pollution watershed protection and restoration activities.

Objective 1: Utilize Watershed Management Framework Steering Committee, NPS CRB, and Stream Restoration Group as liaisons between the NPS Program and watershed-based efforts. - annually

Objective 2: Provide training, assistance, and guidance for public and stakeholder involvement in integrated sampling for watershed characterizations in two watersheds. - 2006

Objective 3: Incorporate the Nine Key Elements into the Resource Extraction Category NPS Management Program to achieve "Enhanced Benefits Status". - annually

Goal 7 – 4: By 2001, begin the implementation of watershed protection and restoration plans in priority watersheds that address resource extraction category NPS pollution utilizing a Holistic Watershed Approach through a Watershed Management Framework that identifies priorities, solutions, funding, implementation, and stakeholders.

Objective 1: Encourage and promote BMPs that ensure proper oil and gas waste disposal, land reclamation, erosion and sediment control, and plugging abandoned wells. - annually

Objective 2: Encourage and promote BMPs that ensure proper oil and gas waste disposal, land reclamation, erosion and sediment control, and plugging abandoned wells. - annually

Objective 3: Implement policies and procedures and offer incentives to encourage business, industry, and public involvement. - annually

Objective 4: Offer incentives to advocate the remining of abandoned mine lands. - annually

Stakeholders:

WVDEP (Mines and Minerals Group Office of Abandoned Mine Lands and Reclamation and Office of Mining and Reclamation, Office of Oil and Gas, and Office of Water Resources), WV Soil Conservation Agency, WV Division Of Forestry, WV Division of Natural Resources, Natural Resources Conservation Service, Environmental Protection Agency, Office of Surface Mining, United States Geological Survey, Watershed Network, Watershed Associations, and the Public.

New Technologies for Prevention and Remediation

Problem:

The development and implementation of new and innovative technologies is required for the prevention and remediation of resource extraction category NPS pollution.

Goal 7 – 5: By 2001, begin the development and implementation of new and innovative BMPs, treatment and abatement alternatives, and prevention technologies for resources extraction category NPS pollution.

Objective 1: Advocate the use of best available technologies for determining and predicting post-mining polluted coal mine drainage on new mining permit applications. - annually

Objective 2: Promote the use of technologies for preventing underground mine discharges and breakouts. - annually

Objective 3: Assist oil and gas industry to develop most cost-effective and environmentally beneficial methods for wastewater disposal and erosion and sediment control. - annually

Objective 4: Encourage policies and procedures development and changes to account for the treatment, abatement, and prevention of the formation of polluted coal mine drainage associated with active mining. - annually

Objective 5: Establish and encourage technology and information transfer and dissemination; innovative technological advancements; new concepts of resource recovery; and diverse stakeholders to apply nontraditional technologies to protection and restoration. - annually

Increasing Existing and Securing New Funding Resources

Problem:

Funding for resource extraction category NPS pollution problems and the associated protection and restoration is significantly inadequate to achieve sustainable environmental benefits in watersheds.

Goal 7 – 6: By 2004, increase existing and secure additional funding for resource extraction category NPS pollution watershed protection and restoration projects, Holistic Watershed Approach, and Watershed Management Framework.

Objective 1: Encourage Congress to allocate the remainder of the Abandoned Mine Land Fund for the purposes it was collected. - 2004

Objective 2: Encourage Congress to spend what is collected annually with the Abandoned Mine Land Fund as outlined in the Surface Mining Control and Reclamation Act of 1977. - 2004

Objective 3: Secure funding resources for long-term integrated sampling for watershed characterizations before, during, and after protection and restoration activities that address resource extraction category NPS pollution. - 2004

Objective 4: Secure funding resources for the development and implementation of new and innovative BMP, treatment, abatement, and prevention technologies for resource extraction category NPS pollution. - 2004

Objective 5: Leverage additional funding resources for plugging abandoned and orphaned oil and gas wells. - 2004

Objective 6: Secure funding resources to begin to address high-volume abandoned mine and oil and gas well discharges. - 2004

Objective 7: Develop and secure long-term operations and maintenance funding for polluted coal mine drainage treatment, abatement, and prevention protection and restoration projects. - 2004

Objective 8: Develop and secure long-term funding resources to continue to provide perpetual treatment and abatement of polluted coal mine drainage. - 2004

Objective 9: Encourage Congress to reauthorize the Surface Mining Control and Reclamation Act of 1977 which is scheduled to expire in 2004. - 2004

Stakeholders:

WVDEP (Mines and Minerals Group Office of Abandoned Mine Lands and Reclamation and Office of Mining and Reclamation, Office of Oil and Gas, and Office of Water Resources), WV Division of Natural Resources, Natural Resources Conservation Service, Environmental Protection Agency, Office of Surface Mining, United States Geological Survey, Industry, WV Coal Association, WV Mining and Reclamation Association, National Mine Land Reclamation Center, United States Army Corps of Engineers, United States Congress, WV Legislature, Watershed Network, Watershed Associations, and the Public.

Stakeholders and Partnerships

Problem:

Potential stakeholders and partners are generally unaware of the extent of water resources degradation from resource extraction category NPS pollution and the availability and high cost of treatment and abatement alternatives for protection and restoration.

Goal 7 – 7: Participate in fostering five Watershed Associations per Watershed Management Framework cycle to implement a Holistic Watershed Approach and participate in the Watershed Management Framework to support watershed protection, restoration, and management activities relating to resource extraction category NPS pollution.

Objective 1: Foster five partnerships per Watershed Management Framework cycle and develop stakeholders to support planning and implementation. - 2006

Objective 2: Work with five Watershed Associations per Watershed Framework cycle interested in watershed protection and restoration. - 2006

Objective 3: Offer two conferences, training, and/or workshops per Watershed Management Framework cycle on assessments, funding, grant writing, Holistic Watershed Approach, monitoring, networking, and Watershed Management Framework regarding resource extraction category NPS pollution. - 2006

Objective 4: Assist five Watershed Associations per Watershed Management Framework cycle through the Stream Partners Program, Holistic Watershed Approach, and Watershed Management Framework in writing grants and leveraging their resources for watershed protection and restoration projects. - 2006

Goal 7 – 8: Participate in five public forums by 2006 to provide outreach and education and create resource extraction category NPS pollution awareness as a part of the Holistic Watershed Approach, Watershed Management Framework, Watershed Network, and Stream Partners Program.

Objective 1: Disseminate information on the extent, causes, and effects of resource extraction category NPS pollution and the benefits of protection and restoration. - annually

Objective 2: Provide outreach, education, and information on protection and restoration, and roles and responsibilities to all stakeholders involved in treatment, abatement, and prevention of resource extraction category NPS pollution. - annually

Objective 3: Provide Annual Status Reports to EPA and all stakeholders. - annually

Stakeholders:

WVDEP (Mines and Minerals Group Office of Abandoned Mine Lands and Reclamation and Office of Mining and Reclamation, Office of Oil and Gas, and Office of Water Res ources), WV Soil Conservation Agency, WV Division Of Forestry, WV Division of Natural Resources, Natural Resources Conservation Service, Environmental Protection Agency, Office of Surface Mining, United States Geological Survey, Industry, WV Coal Association, WV Mining and Reclamation Association, National Mine Land Reclamation Center, Watershed Network, Watershed Associations, and the Public.

V. RESOURCE EXTRACTION CATEGORY NPS ASSESSMENT, MONITORING, SAMPLING, AND WATERSHED CHARACTERIZATIONS

Integrated sampling for watershed characterizations is designed to assist and focus Resource Extraction Category NPS program protection and restoration activities by providing the environmental data and information necessary to support watershed resource management strategies.

NPS assessment, monitoring, sampling, and watershed characterizations are coordinated through the efforts of the many stakeholders committed to the restoration and protection of water resources affected by NPS pollution.

These functions and resultant information and data are utilized to select, prioritize, focus, implement, and evaluate NPS pollution protection and restoration projects. This is accomplished through integration on a watershed basis to aid in the implementation of the NPS Management Program.

Holistic Watershed Approach Protocol

The Holistic Watershed Approach Protocol was designed to guide and support protection and restoration activities in West Virginia's Watersheds. The Protocol is being implemented and demonstrates the need for and effectiveness of integrated sampling for watershed characterizations. More environmental data and information is required to begin to make more informed decisions about where we invest our resources to protect and restore water resources affected by resource extraction NPS pollution.

The Protocol can be implemented to support protection and restoration activities associated with point source and nonpoint source water quality problems. It also augments and complements the Watershed Management Framework and is the vehicle to begin to coordinate integrated sampling for watershed characterizations.

The Holistic Watershed Approach Protocol is design to coordinate the gathering and collection of biological, chemical, and physical information and data with respect to water quality to support protection and restoration utilizing a watershed-based approach. The resultant information and data are utilized to select, prioritize, focus, implement, and evaluate protection and restoration activities in the watershed.

The benefit of integrated sampling for watershed characterizations is the development of partners and stakeholders that participate in the process and are involved in the decision-making of where best to invest our resources to generate the most cost-effective benefits.

The Holistic Watershed Approach Protocol is presented as an appendix.

Unified Watershed Assessment

The Unified Watershed Assessment is an integrated effort to identify watersheds:

- Needing restoration (Category I);
- Needing preventative action to sustain water quality (Category II);
- Which are pristine or sensitive and on federal or state lands (Category III); and

- With insufficient data to make an assessment (Category IV).

This initiative will assist in developing a strong watershed-based approach for collecting information, identifying local needs and priorities, and working in concert with stakeholders and watershed associations.

West Virginia has already implemented its Watershed Management Framework as a way of coordinating protection and restoration activities on a watershed basis. The Framework focuses on the 32 Hydrologic Regions (8-Digit HUCs) and 344 Watersheds (11-Digit HUCs) that make up West Virginia's water resources. Each of the 8-Digit HUCs are divided up into five groups and complements a five year revolving cycle.

The Hydrologic Regions are the largest watersheds or geographic management regions that the stakeholders and partners utilize to organize and coordinate protection and restoration efforts statewide. Water quality activities such as scoping-level monitoring and assessment, data management, permitting, and status reporting is performed at the Hydrologic Region scale. The smaller-scale management units or watersheds are prioritized and identified for more focused data collection, analysis, management strategy development, and implementation.

The Framework focuses on:

- Improving public awareness, understanding, and involvement;
- Improving program efficiency;
- Increasing program effectiveness and cost-effectiveness; and
- Improving information and data management.

The Framework is the driving management force to assist with implementing a Unified Watershed to address NPS pollution problems.

Watershed Restoration Action Strategies

Watershed Restoration Action Strategies (WRAS) are developed for watersheds that are most in need of restoration. West Virginia has prioritized its watersheds based on protection and restoration action strategies as a part of the Watershed Management Framework.

The WRAS incorporates and integrates efforts of other local, state, and federal government agencies, Watershed Associations, the public, and other stakeholders. Each WRAS includes a plan for outreach and education to the public; integrated sampling for watershed characterizations; specific water quality goals and natural resources goals; measures for implementation and effectiveness; milestones; and financial resource needs.

Citizen's Monitoring and Sampling

West Virginia has accomplished integrating its citizens, the public, and other stakeholders into the gathering and collecting of environmental data and information to support protection and restoration projects dealing with NPS pollution, especially resource extraction.

Through the Watershed Management Framework, the Office of Water Resources' Citizens Stream Monitoring Program and Holistic Watershed Approach, citizens and stakeholders are being educated, trained, and incorporated into integrated sampling for watershed characterizations. Citizens are performing assessments on the biological, chemical, and physical water quality of water resources affected by pollution from point sources and nonpoint sources.

Where the program is most effective is when citizens work in concert with government agencies to assure quality assurance and quality control of the information and data being gathered.

V. NINE KEY ELEMENTS IN WEST VIRGINIA'S REVISED NPS MANAGEMENT PROGRAM FOR RESOURCE EXTRACTION CATEGORY

A. Nine Key Elements

1. West Virginia's program contains explicit short- and long-term goals, objectives, and strategies to protect surface and ground water.

The Resource Extraction Category NPS Program 'Strategy' incorporates explicit short- and long-term goals, objectives, and strategies to protect surface and ground water from resource extraction NPS pollution. The Program works in concert with the Watershed Management Framework through a Holistic Watershed Approach.

2. West Virginia partners with and links to appropriate State, interstate, Tribal, Regional, and local entities (including conservation districts), private sector groups, citizens groups, and Federal Agencies.

The NPS Coordinating Review Board, Watershed Assessment Program, TMDLs Stakeholder Groups, Watershed Management Framework, and the partners and stakeholders involved with the Holistic Watershed Approach is evidence that West Virginia is fostering partnerships to support protection and restoration activities dealing with NPS pollution.

3. West Virginia uses a balanced approach that emphasizes both Statewide nonpoint source programs and on-the-ground management of individual watersheds where waters are impaired or threatened.

This is coordinated and integrated with the state's NPS Coordinating Review Board, Watershed Assessment Program, Holistic Watershed Approach, and Watershed Management Framework, and the many other programs that protect and restore watersheds affected by NPS pollution.

4. West Virginia's program (a) abates known water quality impairments from nonpoint source pollution and (b) prevents significant threats to water quality from present and future nonpoint source activities.

Watershed restoration and protection activities are the action strategies to abate and prevent NPS pollution. The Resource Extraction Category NPS Program coordinates and implements Program priorities to resolve NPS pollution problems and prevent future ones.

5. West Virginia's program identifies waters and their watersheds impaired by nonpoint source pollution and identifies important unimpaired waters that are threatened or otherwise at risk. Further, West Virginia establishes a process to progressively address these identified waters by conducting more detailed watershed assessments and developing watershed implementation plans, and then by implementing the plans.

The NPS Coordinating Review Board, Watershed Assessment Program, TMDLs Stakeholder Groups, Watershed Management Framework, and the partners and stakeholders involved with the Holistic Watershed Approach identifies watershed priorities based on impairments by NPS pollution and unimpaired watersheds ion need of protection. Additional information and data is accomplished through integrated sampling for watershed characterizations.

6. West Virginia reviews, upgrades, and implements all program components required by section 319 (b) of the Clean Water Act, and establishes flexible, targeted, and iterative approaches to achieve and maintain beneficial uses of water as expeditiously as practicable. The program includes:

- A mix of water quality-based and/or technology-based programs designed to achieve and maintain beneficial uses of water; and

- A mix of regulatory, non-regulatory, financial, and technical assistance as needed to achieve and maintain beneficial uses of water as expeditiously as practicable.

West Virginia identifies best management practices and treatment and abatement measures utilized to eliminate, control, and treat resource extraction NPS pollution, focusing on those most successful and cost-effective in addressing specific NPS pollutants. The state also complies with "Requirements Governing Water Quality Standards" and "Anti-Degradation Policy" through this process.

A specific goal is achieving water quality standards to support water uses categories locally, within the watershed, and statewide. Implementation is achieved through the development of watershed management strategies for priority watersheds and incorporates the practices and measures to address NPS pollution.

This is coordinated and integrated with the state's NPS Coordinating Review Board, Watershed Assessment Program, Holistic Watershed Approach, and Watershed Management Framework.

7. West Virginia identifies federal lands and activities that are not managed consistently with State nonpoint source program objectives. Where appropriate, West Virginia seeks EPA assistance to help resolve issues.

West Virginia is working with its federal partners to identify lands and activities that contribute to resource extraction NPS pollution. This partnership promotes consistency between the various programs and activities, and aids in the development of holistic or comprehensive watershed management strategies.

This is coordinated and integrated with the state's NPS Coordinating Review Board, Watershed Assessment Program, Holistic Watershed Approach, and Watershed Management Framework.

8. West Virginia manages and implements its nonpoint source program efficiently and effectively, including necessary financial management.

West Virginia utilizes a Holistic Watershed Approach and the Watershed Management Framework to manage and implement the Resource Extraction Category NPS Program. The stakeholders that support the process has agreed to address the point source and nonpoint source pollution problems utilizing a watershed-based approach. It allows an opportunity to pool the resources necessary to implement projects and measure the effectiveness of NPS pollution management.

This is coordinated and integrated with the state's NPS Coordinating Review Board, Watershed Assessment Program, Holistic Watershed Approach, and Watershed Management Framework.

9. West Virginia periodically reviews and evaluates its nonpoint source management program using environmental and functional measures of success, and revises its nonpoint source assessment and its management program at least every five years.

a. Environmental Indicators

b. Monitoring in Watershed Projects

c. National Monitoring Program

The driving force in watershed management in West Virginia is the Watershed Management Framework. The NPS Management and Assessment Programs are incorporated into the Framework and are reviewed, evaluated, and revised to augment and complement a five year management cycle.

The Watershed Assessment Program, Holistic Watershed Approach, and the Framework provide a mechanism for integrated sampling for watershed characterizations to begin to generate the necessary information and data to make more informed decisions as to where we invest our resources. The most cost-effective and environmentally beneficial measures are selected, implemented, and monitored for success.

This is coordinated and integrated with the state's NPS Coordinating Review Board, Watershed Assessment Program, Holistic Watershed Approach, and Watershed Management Framework.

B. Funding Resources

- NPS Base Program and Grants;
- EPA 104 (b) (3) Grants;
- State Revolving Fund;
- Stream Partners Program Fund;
- Abandoned Mine Lands Fund;
- Acid Mine Drainage Treatment and Abatement Fund; and
- Appalachian Clean Streams Initiative;
- Watershed Cooperative Agreement Program;
- Special Reclamation Fund;
- Stream Mitigation Fund; and
- Others

C. Public/Stakeholder Participation

The state's Watershed Management Framework provides the infrastructure that includes all stakeholders and partners involved in developing watershed management strategies to address NPS pollution and implement the most cost-effective protection and restoration projects.

The process provides outreach, education, and training to the stakeholders through the Framework, Holistic Watershed Approach, Stream Partners Program, and the West Virginia Watershed Network to offer a more comprehensive method for addressing NPS pollution problems on a watershed basis.

Appendices

1. AMD Abatement Policy
2. Polluted Coal Mine Drainage Costs Benefits Protocol
3. Holistic Watershed Approach Protocol
4. Office of Oil and Gas Erosion and Sediment Control Field Manual (not included)
5. Enviro Facts (not included)

West Virginia Division of Environmental Protection
Office of Abandoned Mine Lands and Reclamation

AMD Abatement Policy

Policy Objective: Provide a decision making framework within AML&R to identify projects in priority watersheds and stream segments where the best available technology can maximize water quality improvement with available resources.

An AMD committee will be established to consider Water Quality issues, prioritize water quality improvement target areas, review abatement alternatives, and provide project recommendations to the Deputy Chief. The committee will consist of the following members:

Planning Administrator
In-House Design Administrator
SRG Administrator
Realty Administrator
Design Administrator
Construction Administrator
Northern District Engineer
Administration/Funding Administrator
Special Reclamation Administrator

The Abandoned Mine Lands and Reclamation Planning Group working with the Stream Restoration Group will identify and present to the AMD Committee a listing of watersheds and/or stream segments where significant water quality improvements may be possible. The AMD committee will review all available data and select high priority focus areas most likely to be successfully restored with available resources. Goals for stream clean-up accomplishments till program end will be established.

Specific projects within a focus area will be presented to the committee by the Planning Group. Sufficient raw water data will be provided to consider at-source and down stream alternatives. The committee will evaluate each alternative with consideration of the following:

1. Design/Construction

1. Will the technology work with the quality and quantity of acid mine drainage present
2. Expected water quality after treatment
3. Site Topography

2. Realty

1. Ownership & Control

A. For SAPs, Ponds, Wetlands and ALDs, the Realty Section shall obtain Agreements granting DEP the rights to construct, operate, and maintain these systems for their operational life. In addition, these agreements shall prohibit the landowner and successors in title from altering, disturbing and/or removing these facilities giving DEP control over future use of land and facilities while the project is operational.

B. For Limestone Sand Sites, Doser Stations and/or Rotary Drum Stations the Realty Section shall obtain long-term agreements to deposit limestone sand or operate the facilities.

C. If adequate voluntary agreements cannot be obtained to control and protect treatment facilities, the facilities shall not be built.

D. Realty Section shall discuss proposed AMD treatment with landowners during the acquisition of Exploratory Right of Entry agreements so as to gauge the likelihood of obtaining binding agreement for long-term operation and control of facilities. This will eliminate design costs of facilities for which we are unable to obtain long-term agreements.

E. Design Section shall have conceptual design meetings with Engineering Consultants to assure appropriate and approved treatment methods are being designed. This will control design costs and give Realty an opportunity to obtain information to pass along to landowners and confirm they are still on board with granting permission for the treatment facilities.

2. Liability

All SAPS, Ponds and selected Wetlands shall be fenced with a six (6) foot high chainlink fence.

3. Selection

The impacted streams or stream segments to be evaluated as focus areas will be presented to the Committee by the Planning Group. Input to the Planning Group will be by AML professionals with an extensive knowledge of AML impacted watersheds in the state. The Office of Water Resources and their Watershed Basin Coordinator will be

consulted. These people have formal and informal links to outside interests and will have an indirect input regarding initially selected watersheds. Historic water quality data for these watersheds will be reviewed. These data will include known AML discharges, published reports, data from the 303D list, previously completed studies, data collected by the Stream Restoration Group and data from the Office of Water Resources. The goal of this task will be to reduce the list of watersheds to those in which AMD treatment of streams degraded by AML discharges will have a significant impact so that resources can be directed to those areas. The following factors will go into selecting potential AMD projects that will be presented to the AMD committee.

1. Projects with the most favorable cost/benefit ratio will be given the highest priority. The cost of treating AMD in the watershed will be determined. Treatment methods that utilize low cost and little maintenance will be preferred. A low cost, low maintenance form of treatment that will significantly improve the receiving stream will be given greater consideration for selection.

2. Availability of funding for long term operation and adequacy of maintenance funds.

    A. Identify O&M fund source
    B. Present Value project cost analysis and frequency of O&M of each alternative for the life expectancy of the project.
    C. Identify construction funding source

3. Expected outcomes for each method of treatment. This listing shall be heavily weighted toward the top of the list to have home run projects.

    A. Restore dead stream (river or major tributary) to fishery quality stream.
    B. Restore significant distance of named tributary of river to fishery quality stream.
    C. Increase alkalinity (buffering capacity) of marginal fishery.
    D. Significantly reduce the acid load of tributary entering fishery quality stream.
    E. Restore named tributary in conjunction with other projects planned for watershed.
    F. Significantly reduce acid load in named tributary in conjunction with other projects planned in watershed.
    G. Reduce acid load in named tributary only (no significant impact on receiving stream).
    H. Reduce acid load entering named tributary (no significant impact on receiving stream).

3. Operation and Maintenance

1. Written notification by the construction group will be made to SRG to begin monitoring monthly for the first 12 months, quarterly for the next four years, and annually thereafter for the life of the project.

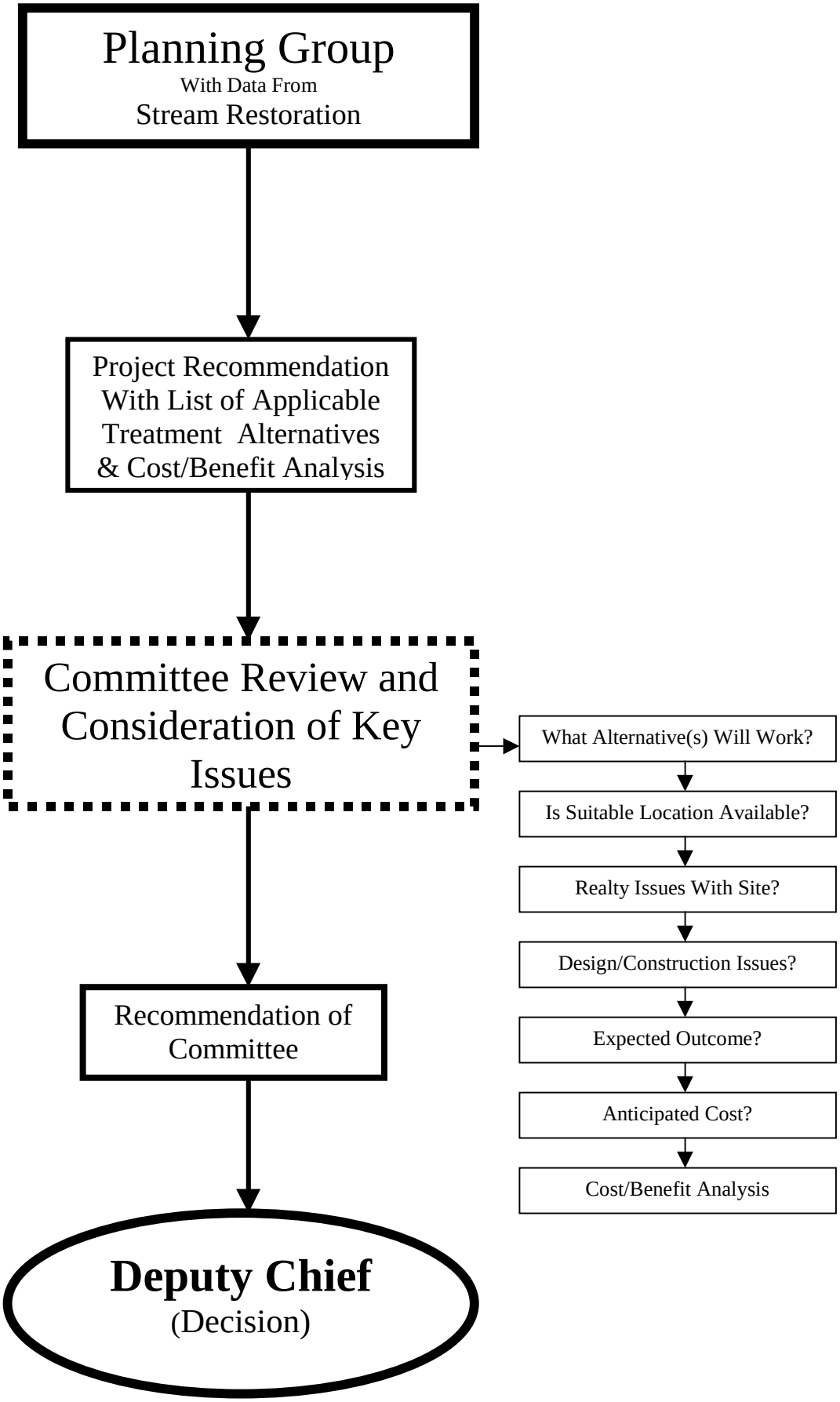
2. Treatment facilities shall be maintained in successful operating condition. If not, DEP shall remove facilities and complete the appropriate reclamation.

3. SRG will report to the committee the performance data of constructed facilities semi-annually in July and January. SRG will report any observed problems with facilities to the Construction Administrator.

4. If metal retention is incorporated in design, an estimate of associate costs of sludge removal and disposal will be made. There shall be a designation of the area where sludge disposal will occur.

5. A GIS database of water treatment projects, sites, and facilities shall be prepared and maintained by SRG.

6. A water project operation and maintenance schedule for each site shall be developed and maintained by the Construction Group.


Planning Group
With Data From
Stream Restoration
Project Recommendation With List of Applicable Treatment Alternatives & Cost/Benefit Analysis
Committee Review and Consideration of Key Issues
What Alternative(s) Will Work?
Is Suitable Location Available?
Realty Issues With Site?
Design/Construction Issues?
Expected Outcome?
Anticipated Cost?
Cost/Benefit Analysis
Recommendation of Committee
Deputy Chief
(Decision)

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Costs Benefits Protocol
Polluted Coal Mine Drainage Treatment Plan

An optimal Polluted Coal Mine Drainage (PCMD) Treatment Plan should be based on treating watersheds which (1) are most severely impacted by PCMD from abandoned mine lands, (2) have the greatest water uses benefits possible after PCMD treatment, (3) have the lowest costs of PCMD treatment, and (4) have the highest economic impacts associated with the benefits of restoring impacted water uses.

Summary of Criteria Utilized to Select PCMD Impacted Watersheds for PCMD Treatment Projects:

(1) Identify watersheds which are most severely impacted by PCMD from abandoned mine lands.

- **Net acid loading in pounds per day;**
- **Iron loading in pounds per day;**
- **Percentage of samples not meeting the water quality standard for aluminum (not to exceed 750 ug/l; Category B Water Uses only) (See Appendix);**
- **Percentage of samples not meeting the water quality standard for dissolved oxygen (not less than 5.0 mg/l at any time; Categories A; B, Warm Water Fishery Streams and Wetlands; C; D; and E only; not less than 7.0 mg/l in spawning areas and in no case less than 6.0 mg/l at any time; Category B, Trout Waters only) (See Appendix);**
- **Percentage of samples not meeting the water quality standard for iron (not to exceed 1.5 mg/l; Categories A; and B, Warm Water Fishery Streams and Wetlands only; not to exceed 0.5 mg/l; Category B, Trout Waters only) (See Appendix);**
- **Percentage of samples not meeting the water quality standard for manganese (not to exceed 1.0 mg/l; Category A only) (See Appendix);**
- **Percentage of samples not meeting the water quality standard for pH (6.0 to 9.0 standard units; Categories A; B; C; D; and E) (See Appendix);**
- **Percentage of watershed stream(s) miles impacted by PCMD; and**
- **Percentage of watershed area that is unreclaimed.**

(2) Identify watersheds which have the greatest water uses benefits possible after PCMD treatment.

- **Water uses impacted in receiving stream(s); and**
- **Water uses impacted downstream of receiving stream(s).**

(3) Identify watersheds which have the lowest costs of PCMD treatment.

- **Estimated PCMD treatment costs (See Appendix).**

(4) Identify watersheds which have the highest economic impacts associated with the benefits of restoring impacted water uses.

- **Estimated economic impacts from restoring impacted water uses (See Appendix).**

Office of Abandoned Mine Lands and Reclamation
Acid Mine Drainage Abatement Policy

Section 3. Selection

Sub-Section 3. Expected outcomes for each method of treatment:

NOTE: This listing shall be heavily weighted toward the top of the list in order to accomplish home run PCMD treatment projects.

- **Restore dead stream (river or major tributary) to fishery quality stream;**
- **Restore significant distance of named tributary of river to fishery quality stream;**
- **Increase alkalinity (buffering capacity) of marginal fishery;**
- **Significantly reduce the acid load of tributary entering fishery quality stream;**
- **Restore named tributary in conjunction with other projects planned for watershed;**
- **Significantly reduce acid load in named tributary in conjunction with other projects planned in watershed;**
- **Reduce acid load in named tributary only (no significant impact on receiving stream); and**
- **Reduce acid load entering named tributary (no significant impact on receiving stream).**

Benefits Claimed In Past:

- **Improved water quality (Clean Water Act Standards target);**
- **Reclaimed lands (grassland habitat and forestland);**
- **Restored water use;**
- **Restored fisheries;**
- **Restored aquatic ecosystem;**
- **Restored wildlife habitat; and**
  - **Recreation:**
  - **Water Contact;**
  - **Camping;**
  - **Hiking;**
  - **Sight-Seeing;**
  - **Etc.**

Costs Benefits Protocol/Process:

STEP 1. **Select Stream(s) or Watershed(s) or Hydrologic Region(s) from Literature Search for Potential PCMD Treatment Project(s) (21 Months Prior to Generating the Spring or Fall AML Projects Priority Lists) [NOTE: Selection is dependent upon the advise and expertise within the Office of Abandoned Mine Lands and Reclamation and indirect input from other entities. Selection is based on information and data associated with Abandoned Mine Lands Priority Projects; Office of Water Resources Watershed Assessment Program, Watershed Management Framework, and Total Maximum Daily Loads - 303 (d) List; Historical Information and Data; and Public Involvement;]**

- **Gather Historical Information and Data through Literature Search (This should take no more than 3 months)**
  - **Evaluate Historical Information and Data from Literature Search**
    - **Identify Stream(s) or Watershed(s) or Hydrologic Region(s) Impacted from Literature Search and Evaluation (Record Information on COSTS BENEFITS PROTOCOL MATRIX)**
      - **Identify Existing Water Use(s) from Literature Search and Evaluation (E)**
      - **Identify Designated Water Use(s) from Literature Search and Evaluation (D)**
      - **Identify Water Use(s) Impacted from Literature Search and Evaluation (Value)**
      - **Identify Water Use(s) Impacted Downstream from Literature Search and Evaluation (Value)**

STEP 2. **Select Stream(s) or Watershed(s) or Hydrologic Region(s) from Sampling for Potential PCMD Treatment Project(s) (18 Months Prior to Generating the Spring or Fall AML Projects Priority Lists)**

- **Gather Information and Data through Sampling (This should take no more than 12 months)**
  - **Evaluate Information and Data from Sampling**
    - **Identify Stream(s) or Watershed(s) or Hydrologic Region(s) Impacted from Sampling and Evaluation (Record Information on COSTS BENEFITS PROTOCOL MATRIX)**
      - **Identify Existing Water Use(s) from Sampling and Evaluation (E)**
      - **Identify Designated Water Use(s) from Sampling and Evaluation (D)**
      - **Identify Water Use(s) Impacted from Sampling and Evaluation (Value)**
      - **Identify Water Use(s) Impacted Downstream from Sampling and Evaluation (Value)**

Costs Benefits Protocol/Process: (Continued)

STEP 3. Select Potential PCMD Treatment Project(s) from Focus Area(s) Sampling (6 Months Prior to Generating the Spring or Fall AML Projects Priority Lists)

- **Gather Information and Data through Focus Area(s) Sampling (This should take no more than 6 months)**
  - **Evaluate Information and Data from Focus Area(s) Sampling**
    - **Identify Stream(s) or Watershed(s) or Hydrologic Region(s) Impacted from Focus Area(s) Sampling and Evaluation (Record Information on COSTS BENEFITS PROTOCOL MATRIX)**
      - **Identify Water Use(s) Impacted from Focus Area(s) Sampling and Evaluation (Value)**
      - **Identify Water Use(s) Impacted Downstream from Focus Area(s) Sampling and Evaluation (Value)**

STEP 4. Select PCMD Treatment Project(s) from Project Area(s) Sampling (Provide Selected PCMD Treatment Project(s) to Planning Administrator in order to Generate the Spring or Fall AML Projects Priority Lists)

- **Gather Information and Data through Project Area(s) Sampling (This should take no more than 6 months)**
  - **Evaluate Information and Data from Project Area(s) Sampling**
    - **Identify Stream(s) or Watershed(s) or Hydrologic Region(s) Impacted from Project Area(s) Sampling and Evaluation (Record Information on COSTS BENEFITS PROTOCOL MATRIX)**
      - **Identify Water Use(s) Impacted from Project Area(s) Sampling and Evaluation (Value)**
      - **Identify Water Use(s) Impacted Downstream from Project Area(s) Sampling and Evaluation (Value)**

STEP 5. Implement PCMD Treatment Project(s) (Construction Phase)

- **Gather Information and Data through Post-Construction Sampling (This sampling is performed in relationship to the project(s) life expectancy)**
  - **Evaluate Information and Data from Post-Construction Sampling**
    - **Identify Stream(s) or Watershed(s) or Hydrologic Region(s) Benefited from Post-Construction Sampling and Evaluation (Record Information on COSTS BENEFITS PROTOCOL MATRIX)**
      - **Identify Water Use(s) Benefited from Post-Construction Sampling and Evaluation (Value)**
      - **Identify Water Use(s) Benefited Downstream from Post-Construction Sampling and Evaluation (Value)**

Water Uses Considered:

"Designated Uses" are those uses specified in water quality standards for each water body or segment whether or not they are being attained.

Or

"Existing Uses" are those uses actually attained in a water body on or after November 28, 1975, whether or not they are included as designated uses in the water quality standards.

Water Use Category (Value)	**Definition**
Category A - Water Supply, Public	
Water Supply, Public (8)	**Waters which, after conventional treatment, are used for human consumption.**
Category B - Propagation and Maintenance of Fish and other Aquatic Life	
Trout Waters (10)	**Streams or stream segments which sustain year-round trout populations. Excluded are those streams or stream segments which receive annual stockings of trout but which do not support year-round trout populations.**
Warm Water Fishery Streams (8.5)	**Streams or stream segments, which contain populations composed of all warm water aquatic life.**
Wetlands (8.5)	**Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.**
Category C - Water Contact Recreation	
Water Contact Recreation (6)	**Swimming, fishing, water skiing, and certain types of pleasure boating such as sailing in very small craft and outboard motor boats.**
Category D - Agriculture and Wildlife Uses	
Irrigation (4)	**All stream segments used for irrigation.**
Livestock Watering (4)	**All stream segments used for livestock watering.**
Wildlife (4)	**All stream segments and wetlands used by wildlife.**

Water Uses Considered: (Continued)

Water Use Category (Value)	Definition
Category E - Water Supply Industrial, Water Transport, Cooling and Power	**Cooling water, industrial water supply, power production, commercial and pleasure vessel activity, except those small craft include in Category C.**
Cooling Water (2)	**All stream segments having one (1) or more users for industrial cooling.**
Industrial (2)	**All stream segments with one (1) or more industrial users. It does not include water for cooling.**
Power Production (2)	**All stream segments extending from a point 500 feet upstream from the intake to a point on half ½ mile below the wastewater discharge point.**
Water Transport (2)	**All stream segments modified for water transport and having permanently maintained navigation aides.**

Source: **46CSR1, West Virginia; Title 46, Legislative Rule, Environmental Quality Board; Series 1, Requirements Governing Water Quality Standards 2000 (See Appendix).**

Note: **For each Water Use Category and Sub-Category, a numerical value from 2 to 10 based on the quality of the water needed to support the water use has been arbitrarily assigned. This numerical scoring or weighting system makes the assumption that the higher the water quality standards needed to support a water use – the more valuable that particular water use is.**

Costs Benefits Protocol
Matrices
Instructions

Costs Benefits Protocol
Matrix
STEP 1

Identify Stream(s) or Watershed(s) or Hydrologic Region(s) Impacted from Literature Search and Evaluation: _____

_____

- **Identify Existing Water Use(s) from Literature Search and Evaluation (E)**
- **Identify Designated Water Use(s) from Literature Search and Evaluation (D)**
- **Identify Water Use(s) Impacted from Literature Search and Evaluation (Value)**
- **Identify Water Use(s) Impacted Downstream from Literature Search and Evaluation (Value)**

Water Use Categories➔	Category A	Category B			Category C	Category D			Category E				
	Water Supply, Public	Propagation and Maintenance of Fish and other Aquatic Life			Water Contact Recreation	Agricultural and Wildlife Uses			Water Supply Industrial, Water Transport, Cooling and Power				
Water Use	Water Supply, Public	Trout Waters	Warm Water Fishery Streams	Wetlands	Water Contact Recreation	Irrigation	Livestock Watering	Wildlife	Water Transport	Cooling Water	Power Production	Industrial	
(Value)➔	(8)	(10)	(8.5)	(8.5)	(6)	(4)	(4)	(4)	(2)	(2)	(2)	(2)	
Hydrologic Unit, Focus Area, Project Area, or Target Area➔													Row Totals:
8 Digit HUC 32 Hydrologic Regions													
11 Digit HUC 344 Watersheds													
14 Digit HUC/DNR Codes Sub-Watersheds													
18 Digit HUC/DNR Codes Sub-Sub-Watersheds													
Stream or Streams													
Column Totals:													
Water Use Category Averages:													

Costs Benefits Protocol
Matrix
STEP 2

Identify Stream(s) or Watershed(s) or Hydrologic Region(s) Impacted from Sampling and Evaluation: _____

_____

- **Identify Existing Water Use(s) from Sampling and Evaluation (E)**
- **Identify Designated Water Use(s) from Sampling and Evaluation (D)**
- **Identify Water Use(s) Impacted from Sampling and Evaluation (Value)**
- **Identify Water Use(s) Impacted Downstream from Sampling and Evaluation (Value)**

Water Use Categories➔	Category A	Category B			Category C	Category D			Category E				
	Water Supply, Public	Propagation and Maintenance of Fish and other Aquatic Life			Water Contact Recreation	Agricultural and Wildlife Uses			Water Supply Industrial, Water Transport, Cooling and Power				
Water Use	Water Supply, Public	Trout Waters	Warm Water Fishery Streams	Wetlands	Water Contact Recreation	Irrigation	Livestock Watering	Wildlife	Water Transport	Cooling Water	Power Production	Industrial	
(Value)➔	(8)	(10)	(8.5)	(8.5)	(6)	(4)	(4)	(4)	(2)	(2)	(2)	(2)	
Hydrologic Unit, Focus Area, Project Area, or Target Area➔													Row Totals:
8 Digit HUC 32 Hydrologic Regions													
11 Digit HUC 344 Watersheds													
14 Digit HUC/DNR Codes Sub-Watersheds													
18 Digit HUC/DNR Codes Sub-Sub-Watersheds													
Stream or Streams													
Column Totals:													
Water Use Category Averages:													

Costs Benefits Protocol
Matrix
STEP 3

Identify Stream(s) or Watershed(s) or Hydrologic Region(s) Impacted from Focus Area(s) Sampling and Evaluation: _____

- **Identify Water Use(s) Impacted from Focus Area(s) Sampling and Evaluation (Value)**
- **Identify Water Use(s) Impacted Downstream from Focus Area(s) Sampling and Evaluation (Value)**

Water Use Categories➔	Category A Water Supply, Public	Category B Propagation and Maintenance of Fish and other Aquatic Life			Category C Water Contact Recreation	Category D Agricultural and Wildlife Uses			Category E Water Supply Industrial, Water Transport, Cooling and Power				
Water Use	Water Supply, Public	Trout Waters	Warm Water Fishery Streams	Wetlands	Water Contact Recreation	Irrigation	Livestock Watering	Wildlife	Water Transport	Cooling Water	Power Production	Industrial	
(Value)➔	(8)	(10)	(8.5)	(8.5)	(6)	(4)	(4)	(4)	(2)	(2)	(2)	(2)	
Hydrologic Unit, Focus Area, Project Area, or Target Area➔													Row Totals:
8 Digit HUC 32 Hydrologic Regions													
11 Digit HUC 344 Watersheds													
14 Digit HUC/DNR Codes Sub-Watersheds													
18 Digit HUC/DNR Codes Sub-Sub-Watersheds													
Stream or Streams													
Column Totals:													
Water Use Category Averages:													

Costs Benefits Protocol
Matrix
STEP 4

Identify Stream(s) or Watershed(s) or Hydrologic Region(s) Impacted from Project Area(s) Sampling and Evaluation: _____

- **Identify Water Use(s) Impacted from Project Area(s) Sampling and Evaluation (Value)**
- **Identify Water Use(s) Impacted Downstream from Project Area(s) Sampling and Evaluation (Value)**

Water Use Categories➔	Category A Water Supply, Public	Category B Propagation and Maintenance of Fish and other Aquatic Life			Category C Water Contact Recreation	Category D Agricultural and Wildlife Uses			Category E Water Supply Industrial, Water Transport, Cooling and Power				
Water Use	Water Supply, Public	Trout Waters	Warm Water Fishery Streams	Wetlands	Water Contact Recreation	Irrigation	Livestock Watering	Wildlife	Water Transport	Cooling Water	Power Production	Industrial	
(Value)➔	(8)	(10)	(8.5)	(8.5)	(6)	(4)	(4)	(4)	(2)	(2)	(2)	(2)	
Hydrologic Unit, Focus Area, Project Area, or Target Area➔													Row Totals:
8 Digit HUC 32 Hydrologic Regions													
11 Digit HUC 344 Watersheds													
14 Digit HUC/DNR Codes Sub-Watersheds													
18 Digit HUC/DNR Codes Sub-Sub-Watersheds													
Stream or Streams													
Column Totals:													
Water Use Category Averages:													

Costs Benefits Protocol
Matrix
STEP 5

Identify Stream(s) or Watershed(s) or Hydrologic Region(s) Benefited from Post-Construction Sampling and Evaluation: _____

- **Identify Water Use(s) Benefited from Post-Construction Sampling and Evaluation (Value)**
- **Identify Water Use(s) Benefited Downstream from Post-Construction Sampling and Evaluation (Value)**

Water Use Categories➔	Category A	Category B			Category C	Category D			Category E				
	Water Supply, Public	Propagation and Maintenance of Fish and other Aquatic Life			Water Contact Recreation	Agricultural and Wildlife Uses			Water Supply Industrial, Water Transport, Cooling and Power				
Water Use	Water Supply, Public	Trout Waters	Warm Water Fishery Streams	Wetlands	Water Contact Recreation	Irrigation	Livestock Watering	Wildlife	Water Transport	Cooling Water	Power Production	Industrial	
(Value)➔	(8)	(10)	(8.5)	(8.5)	(6)	(4)	(4)	(4)	(2)	(2)	(2)	(2)	
Hydrologic Unit, Focus Area, Project Area, or Target Area➔													Row Totals:
8 Digit HUC 32 Hydrologic Regions													
11 Digit HUC 344 Watersheds													
14 Digit HUC/DNR Codes Sub-Watersheds													
18 Digit HUC/DNR Codes Sub-Sub-Watersheds													
Stream or Streams													
Column Totals:													
Water Use Category Averages:													

At-Source Polluted Coal Mine Drainage Treatment Costs:

Polluted coal mine drainage (PCMD) treatment costs are based on acid and iron loading in the receiving stream(s). The options considered to abate PCMD problems of acidity and iron are Anoxic Limestone Drains (ALD's) and Constructed Wetlands. It is believed that similar cost ratios would be found if other PCMD treatment methods, such as chemical system, were used to estimate costs based on the iron and acid loadings.

The costs of ALD's and Constructed Wetlands to abate the acid and iron loadings were based on the formulas and cost estimates developed by the Abandoned Mine Lands Program and Special Reclamation Program.

Formula used to estimate the costs of an ALD is:

Construction Cost, in Dollars ($), for a 20 Year ALD:

ALD Construction Cost = net acid load (tons/year) * 20 years * 120 ($/ton/year)

The $120 is an estimated cost to construct an ALD per ton of limestone. This cost was obtained by an average cost per ton of limestone placed in ALD's constructed by this office.

Formula used to estimate the costs of a Constructed Wetland is:

Constructed Wetland Cost, in Dollars ($), if the "Typical pH" is < 4.0 in the Receiving Stream:

Constructed Wetland Cost = iron load (pounds/day) * 1220 (feet^2/pounds/day) * 15 ($/feet^2)

Constructed Wetland Cost, in Dollars ($), if the "Typical pH" is > 4.0 in the Receiving Stream:

Constructed Wetland Cost = iron load (pounds/day) * 488 (feet^2/pounds/day) * 15 ($/feet^2)

The choice of Constructed Wetland formula depends upon the "Typical pH" in the receiving stream. The United States Bureau of Mines research indicates that wetlands remove iron at 4 to 10 grams per day per square meter of wetland (Davis, 1994). At a "Typical pH" of < 4.0, 4 grams per day per square meter is used. At a "Typical pH" > 4.0, 10 grams per day per square meter is used. These convert to 1 pound/day/1220 square feet and 1 pound/day/488 square feet respectively. The $15 is the average cost per square foot of Constructed Wetland based on wetlands installed by this office. The $15 was obtained by dividing the total cost of the project including mobilization, diversions, profit, etc., by the square footage of wetland.

The choice of which treatment system would be best for PCMD treatment in West Virginia's watersheds is based on the raw water chemistry of the receiving stream. That is, PCMD from an abandoned mine site can be classified as either net acidic or net alkaline. If the PCMD in the receiving stream creates a net acidic condition, then alkalinity must be added to remove metals and raise pH. For net acidic water, treatment costs equal the costs of constructing and ALD plus the costs to construct a wetland to abate the iron loading. If the receiving stream had a net alkaline condition, the most common treatment option is to create an aerobic wetland (Hedin and Narin, 1992). An aerobic wetland is a passive technology which aerates the water with rip-rap ditches of waterfalls to facilitate precipitation of metals. For watersheds with a net alkaline water condition, construction cost estimates for aeration structures need to be considered.

In-Stream Polluted Coal Mine Drainage Treatment Costs:

Polluted coal mine drainage (PCMD) treatment costs are based on acid loading in the receiving stream(s). The option considered to abate PCMD problems of acidity is In-Stream Limestone Sand (ILS) Treatment.

The cost of ILS Treatment to abate the acid loading is based on the formula and cost estimates developed by the West Virginia Division of Natural Resources in conjunction with the Abandoned Mine Lands Program.

Formula used to estimate the costs of ILS Treatment is:

Treatment Cost, in Dollars ($), for 1 Year of ILS Treatment:

ILS Treatment Cost = annual acid load (tons/year) * 30 to 40 ($/ton of limestone sand)

The $30 to $40 is an estimated cost per ton of limestone sand based on the current market value. This cost was obtained by the range of cost per ton of limestone sand utilized in ILS Treatment by this office. This is a 1:1 ratio in that 1 ton of limestone sand will neutralize 1 ton of acid. For the initial year's treatment, it is necessary to calculate the limestone sand needed based on two-times (2) the annual acid load. This has been deemed a safety factor for maximum neutralization potential and will usually result in the availability of reserve limestone sand leftover within the surface water system. During subsequent years' treatment, we should only have to replace the limestone sand that was used-up during the previous year's treatment, however, as a rule-of-thumb, it may be more effective to calculate the limestone sand needed based on one and a half-times (1½) the annual acid load.

It is recommended that a > or = to 95% $CaCO_3$ equivalent limestone sand product be utilized for ILS Treatment. A sieve analysis needs to be performed on the sand to appropriately size the product. Using limestone sand that is < or = to 2.0 millimeters in diameter (particle size) is best for optimal dissolution of the product in-stream due to surface area. Cost estimates need to be based on current field and laboratory water quality data in order to calculate the annual acid load of PCMD impacted stream. The area of each stream watershed should also be determined. Tonnages of required limestone sand, cost per ton including delivery, should be calculated for the initial year's treatment and subsequent years' treatment. Treatment site preparation cost estimates are not included in this formula. It is expected that no one treatment site preparation cost estimates should exceed $5,000.00. These treatment site preparation cost estimates are generally on the average of $2,500.00 per site (based on historical treatment by the DNR and the DEP). If roads need to be constructed in order to access the proposed treatment site, then these costs may be estimated much higher.

Site Location: _____

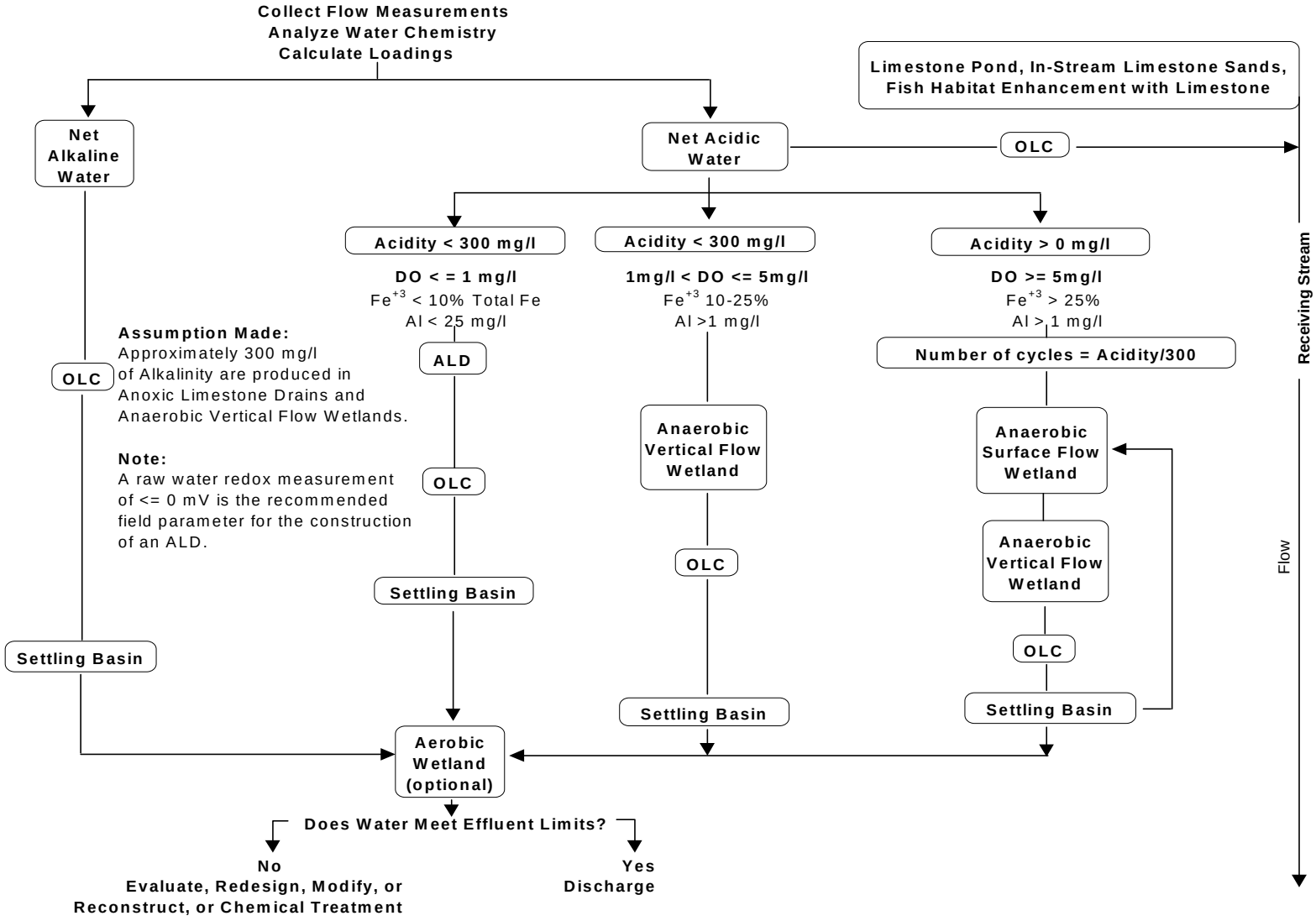
Notes: _____

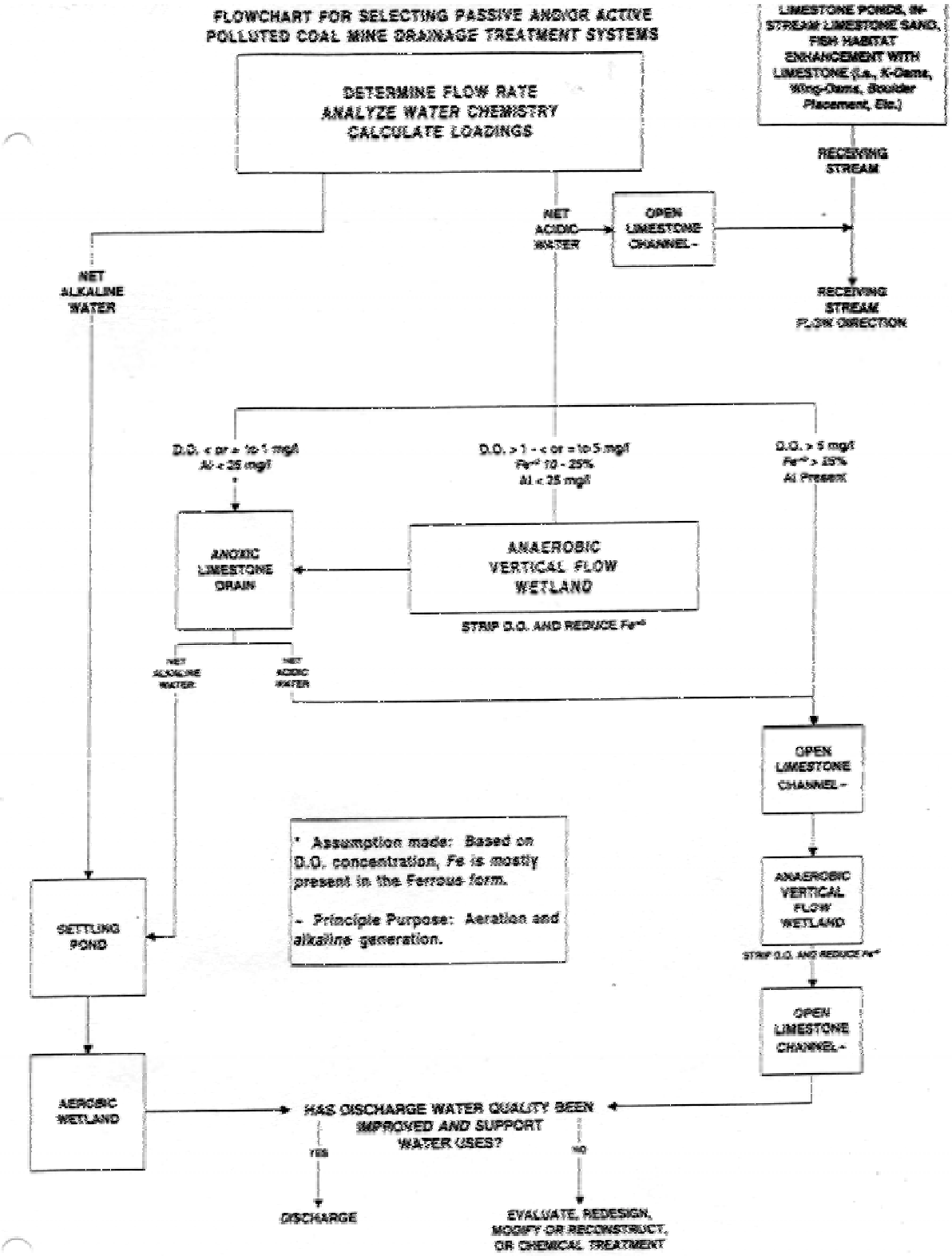
PARAMETER LIMITATIONS OF TREATMENT TECHNOLOGIES®^

Number of Samplings:		**Design Limits**										
Parameters	**Measured Values, Max/Min** (g)	**ALD** (m) & (o)	**Anaerobic Wetland** (o)	**APS Or SAPS** (o)	**RAPS** (o)	**Aerobic Wetland** (p)	**Settling Ponds** (p)	**LSP** (m) & (o)	**OLC** (q)	**In-Stream Limestone Sand**	**In-Stream Dosing Quick Lime Or Limestone**	**Fish Habitat Enhancement With Limestone**
Flow, gpm		< 500 (b)	(i)	(i)	(i)	(i)	(i)	< 500 (b)	(a)	*	> 4 cfs (j)	*
D.O., mg/l	(h)	< or = to 1 (f)	> 1 - < or = to 5 (e)	> or = to 1 (e) & (k)	> or = to 1 (e) & (k)	*	*	< or = to 1 (f)	*	*	*	*
pH		< 5	> 3 (d)			> or = to 4.5	> 4.5	< 5	*		*	*
Hot Acidity, mg/l		< or = to 200 (n)	(i)	NET ACIDIC	NET ACIDIC	(l)	NET	< or = to 200 (n)	*	NET ACIDIC	NET	*
Alkal., mg/l		*	*			NET ALK.	ALK.	*	*		ACIDIC	*
Tot. Fe, mg/l		*	(i)	*	*	(i)	*	*	*	*	*	*
Fe+++, mg/l	(h)	< or = to 25	< 50 (c)	*	*	(i)	*	< or = to 25	*	*	*	*
Fe++, mg/l	(h)	*	(i)	*	*	< 50 (c)	< 50 (c)	*	*	*	*	*
Mn, mg/l		*	*	*	*	*	*	*	*	*	*	*
Al, mg/l		< 25	*	*	*	*	*	< 25	*	*	*	*
Sulfate, mg/l		< 2,000	(e)	(e)	(e)	*	*	< 2,000	*	*	*	*

* Not applicable or not available
(a) Based on channel length and width restrictions and required contact time. 100% neutralization can be achieved with a 3 hour residence time; 90% with 1 hour.
(b) Little experience with flows greater than 500 gpm. Suitability for flows greater than 100 gpm based on low Fe, Mn, and Al levels.
(c) Unless series of aeration unit - wetland cell combinations are provided.
(d) > 3 for anaerobic wetland unless limestone is added to the substrate, in which case, pH< 3 is OK.
(e) Organic layer strips D.O. and reduces sulfate concentration.
(f) Unless the metals content is very low.
(g) Representative of flows discharging from the site.
(h) Seep locations only.
(i) Restricted by available area at site.
(j) Drum Doser.
(k) Unless the metals content is very high.
(l) Acidic if pre-treatment precipitation is required.
(m) It is recommended that O.R.P. be < 0 mV.
(n) Assumption is made that 250 mg/l alkalinity are produced.
(o) Maximum alkaline generation requires 14 – 23 hours retention time. Maximum retention time is recommended if chemical/biological reduction is necessary.
(p) Aerobic Fe removal requires a retention time of 24 – 48 hours.
(q) Recommended gradient > or = to 90%.

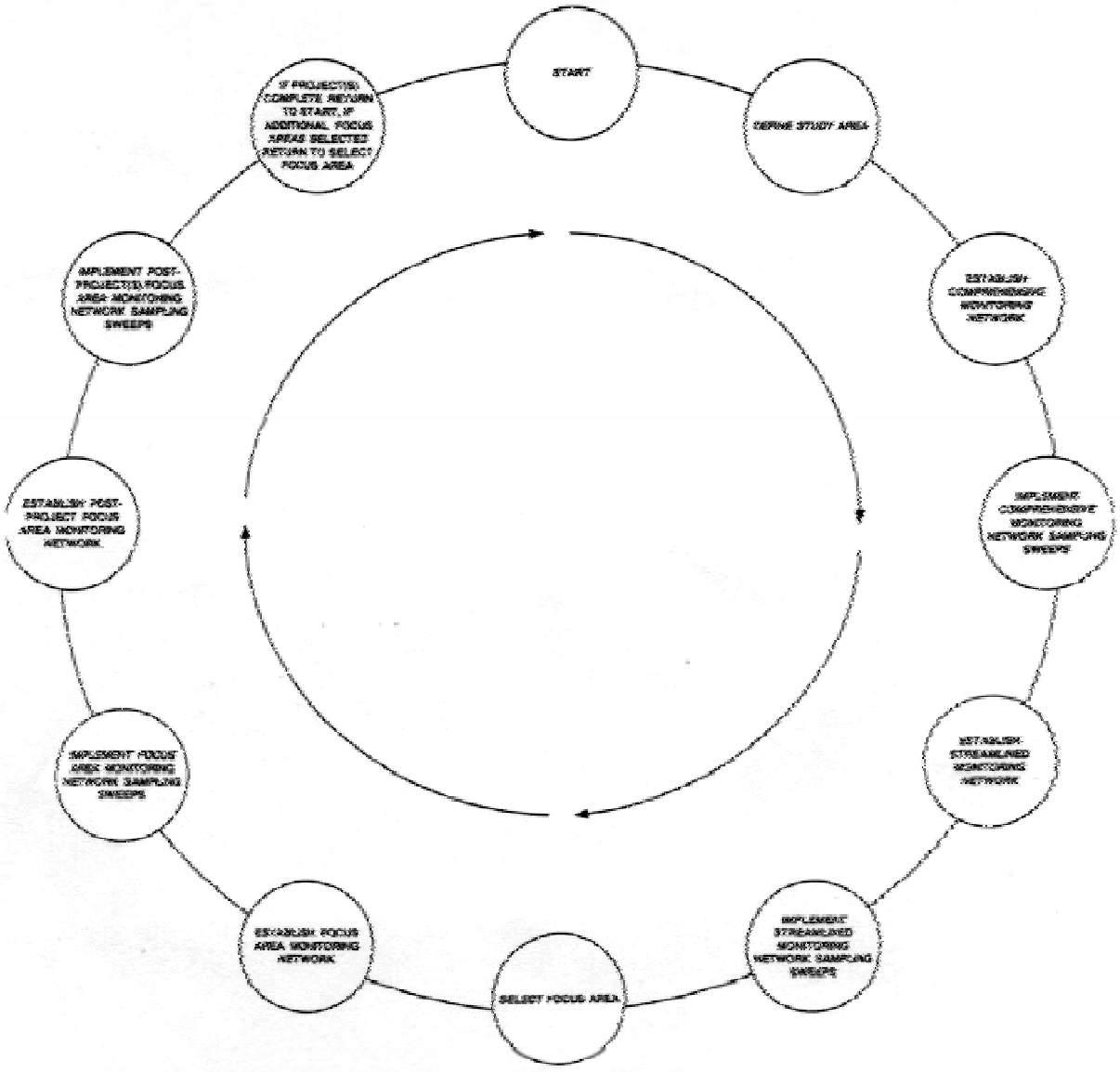
®Adapted from North Branch Potomac River Environmental Restoration Reconnaissance/Feasibility Study, Michael Baker Jr., Inc.
^ Edited and revised by the West Virginia Division of Environmental Protection's Stream Restoration Group, 2000.


Collect Flow Measurements
Analyze Water Chemistry
Calculate Loadings
Limestone Pond, In-Stream Limestone Sands, Fish Habitat Enhancement with Limestone
Net Alkaline Water
Net Acidic Water
OLC
Receiving Stream
Acidity < 300 mg/l
DO < = 1 mg/l
Fe+3 < 10% Total Fe
Al < 25 mg/l
Acidity < 300 mg/l
1mg/l < DO <= 5mg/l
Fe+3 10-25%
Al >1 mg/l
Acidity > 0 mg/l
DO >= 5mg/l
Fe+3 > 25%
Al > 1 mg/l
Assumption Made:
Approximately 300 mg/l of Alkalinity are produced in Anoxic Limestone Drains and Anaerobic Vertical Flow Wetlands.
Note:
A raw water redox measurement of <= 0 mV is the recommended field parameter for the construction of an ALD.
Number of cycles = Acidity/300
ALD
OLC
Anaerobic Vertical Flow Wetland
Anaerobic Surface Flow Wetland
Anaerobic Vertical Flow Wetland
OLC
Settling Basin
Settling Basin
Settling Basin
Settling Basin
Aerobic Wetland (optional)
Flow
Does Water Meet Effluent Limits?
No
Evaluate, Redesign, Modify, or Reconstruct, or Chemical Treatment
Yes
Discharge



SOURCE: FLOWCHART FOR DESIGNING AND SIZING PASSIVE POLLUTED COAL MINE DRAINAGE TREATMENT SYSTEMS (HEDIN AND NARIN, 1992). EDITED AND REVISED BY WEST VIRGINIA DIVISION OF ENVIRONMENTAL PROTECTION'S STREAM RESTORATION GROUP, 2006.

HOLISTIC WATERSHED APPROACH PROTOCOL



Other Benefits:

- **Restored fisheries.**

  The benefits of restoring West Virginia's streams and water resources to a fishery quality provide a major economic impact to the state. Angling in all waters within West Virginia is directly reflected in the following Economic Estimates:

- **Retail Sales;**
- **Economic Output;**
- **Jobs;**
- **Wages;**
- **Sales Tax;**
- **State Income Tax; and**
- **Federal Income Tax.**

The West Virginia Division of Natural Resources Technical Support Unit, 1998, has developed "Trout Fishing Economics" for the purpose of accurately projecting the dollars generated from angling and the economic impact it has on the state. The following is a breakdown of the estimates:

Trout Fishing Economics

Sources: 1996 National Survey of Fishing, Hunting, and Wildlife Associated Recreation; West Virginia (USFWS) 1996 Economic Impact of Sport Fishing in West Virginia (ASA)

Participation Estimates	**All Waters**	**Lakes**	**Streams**
Anglers	174,000	N/A	174,000
Days	1,881,000	564,300	1,316,700

Economics Estimates	**All Fishing**	**Trout**	**Trout Stream**
Retail Sales	$202,922,711	$76,436,171	$53,505,320
Economic Output	$308,804,127	$115,183,939	$80,628,758
Jobs	4,450	1,660	1,162
Wages	$71,238,378	$26,571,915	$18,600,340
Sales Tax	$12,295,363	$4,486,170	$3,210,319
State Income Tax	$2,048,445	$784,070	$534,849
Federal Income Tax	$6,323,516	$2,358,671	$1,651,070

Unitized Estimates For Trout Streams

Miles of Trout Stream	2,000

Economic Estimates	**Per Mile**	**Per Day**	**Per Angler Year**
Retail Sales	$26,752.66	$40.64	$307.50
Economic Output	$40,314.38	$61.24	$463.38
Jobs	0.5809	0.0009	0.0067
Wages	$9,300.17	$14.13	$106.90
Sales Tax	$1,605.16	$2.44	$18.45
State Income Tax	$267.42	$0.41	$3.07
Federal Income Tax	$825.54	$1.25	$9.49

Other Estimates	**Per Mile**	**Per Angler**
Anglers	87.00	N/A
Days	658.35	7.57
Miles	N/A	0.01

Summary

One mile of average trout stream in West Virginia:

Is fished by	**87**	**anglers**
For	**658**	**days**
And generates	**$26,752.66**	**in retail sales**
	0.58	**jobs**
	$9,300.17	**in job wages and salaries**
	$1,605.16	**in state sales tax revenues**
	$267.42	**in state income tax revenues**
	$825.54	**in federal income tax revenues**
	$40,314.38	**in total economic impact**

This is an average of high-use, stocked streams and low-use brook trout streams. If you are projecting economic impact from these figures, cite the average and adjust it up or down to reflect the nature of the affected stream and its proposed management.

Source: West Virginia Division of Natural Resources Technical Support Unit, 08/19/98.

Based on the "Trout Fishing Economics" presented above, the West Virginia Division of Natural Resources has determined that $40.64/Angler/Day is representative of all fishing economic benefits in West Virginia.

Therefore, One mile of average water resource in West Virginia:

Is fished by	**87**	**anglers**
For	**658**	**days**
And generates	**$26,752.66**	**in retail sales**
	0.58	**jobs**
	$9,300.17	**in job wages and salaries**
	$1,605.16	**in state sales tax revenues**
	$267.42	**in state income tax revenues**
	$825.54	**in federal income tax revenues**
	$40,314.38	**in total economic impact**

OVERVIEW OF AVAILABLE POLLUTED COAL MINE DRAINAGE CONTROL AND TREATMENT TECHNOLOGIES

Two distinct approaches are used to abate stream pollution caused by polluted coal mine drainage (PCMD) discharges from abandoned mine land sites. They are:

1. Implementing techniques to control (reduce and/or prevent) PCMD formation.

2. Treating PCMD (once formed) to meet desired water quality standards prior to its discharge. Both conventional chemical treatment systems (systems whereby alkaline chemicals are dispensed directly into the PCMD), and passive measures (chemical and biological processes, e.g., wetlands) are used.

Treatment techniques used to control PCMD generation are based on the principle of excluding access of air (oxygen) and water to the exposed surfaces of acid producing materials generated during surface or underground coal mining.

Treatment techniques, on the other hand, are used to neutralize the acidity of PCMD already generated and facilitate precipitation of contaminant metals toe the extent necessary t o meet desired water quality standards. Selection of proper chemicals and/or passive treatment measures to treat PCMD varies with each PCMD problem encountered.

Techniques that Control the Generation of PCMD

Various methods have been used in the past and may be used successfully in the future to control PCMD generation, particularly at abandoned mine land sites. PCMD control can be accomplished by: 1) diverting run-on to the mine or mine spoil area, 2) backfilling the mine workings, 3) capping mine spoil areas, and/or 4) sealing entries to underground mine workings. More detailed discussions of these techniques follow.

Diversions

Structures generally are installed to divert surface water run-on away from mining/mine spoil areas and thereby prevent its infiltration into the mine workings or mine spoil/refuse generated and placed during mining operations. Water diversion involves collection of water before it enters the mine area, and then conveying it around and away from the mine site. Water diversion decreases erosion and sedimentation, reduces the volume of PCMD generation, and reduces treatment costs by reducing the volume of water that would otherwise come in contact with acid producing rock or mine spoil. Ditches, flumes, pipes, trench drains, berms, and dikes are all commonly used for water diversion. Diversion ditches are usually constructed upslope of the surface mine and mine spoil, allowing surface water to flow around and away from the mining area.

Groundwater diversion may be effected in a surface mine be const5ructing drains along the bottom of the highwall to intercept incoming groundwater from the mine prior to its contact with PCMD forming mine spoil.

Backfilling

Backfilling as a technique to reduce PCMD formation is particularly suitable for underground mine workings. Backfilling mine voids will educe or preclude the collection or passage of air (oxygen) and water (surface and groundwater) into the mine, thereby reducing or preventing PCMD formation. This technique has been used frequently in active underground mines, particularly for subsidence control. In such situations, reduction of PCMD formation ash has always been an added benefit. Mine backfill material can consist of mine waste (refuse), sand, flyash, or low strength grout (flyash and cement). Backfilling of abandoned underground mines generally is difficult and costly due to the unreliability of mine maps an access difficulty. Therefore, backfilling of abandoned underground mine workings typically is carried out only for subsidence control. Although backfilling of underground mines with flyash has been proposed by

various researchers to control PCMD formation, its successful use is not certain because of associated costs and difficulties in obtaining reliable mine maps (abandoned mines).

Backfilling at a surface mine sites consists of backfilling the unreclaimed highwall, surface mine pot, and any impoundments. Such backfilling is aimed at reducing or precluding collection or passage or air and water in acid forming rock.

Regrading and Capping

For surface mine areas, regrading and revegetating the spoil and capping the reclaimed site with low permeability material are aimed at reducing surface water infiltration into the acid producing spoil.

Unreclaimed abandoned surface mine spoil is frequently a major PCMD source. To control surface water infiltration into spoil, it is necessary that the spoil be excavated and placed back in compacted lifts (i.e., each lift compacted to at least 95 percent of the maximum dry density determined in accordance with ASTM Test Method D698) and then properly regarded to eliminate any closed contour depression that may create surface water ponding. During regrading, fine-grained alkaline material containing unreacted calcium oxide such a Circulating Fluidized Bed (CFB) ash may be incorporated into the top three to five feet of the regraded spoil to minimize surface water infiltration and provide an alkaline amendment.

Capping the regarded spoil or refuse area with compacted clayey soil (hydraulic conductivity of $1x10^{-6}$ to $1x10^{-7}$ cm/sec) may substantially reduce the movement of oxygen (air) and water into underlying acid forming materials.

Saturated clay/capillary type barriers (caps) also have been used to control air and water infiltration into regraded mine spoil and refuse, thereby controlling PCMD formation. One such barrier has been used in the Heath Steele Mine in New Brunswick, Canada and is approximately 4.5 feet thick. It consists of the following layers (listed in descending order): a 4-inch gravel layer (for erosion control), a 12-inch gravel/sand layer (evaporation barrier), a 24-inch compacted till (hydraulic conductivity $1x10^{-6}$ cm/sec), and a 12-inch layer of sand placed over the pyretic acid rock (PCMD forming material). Performance of this barrier was monitored for five years and was found to be effective in excluding 98-99 percent of the surface precipitation from infiltrating into the acid forming rock.

A similar type of barrier was used and studied for more than 3 years at the Waite Amulet Mine near Rouyn-Noranda, Quebec. The barrier consisted of a 2-foot thick layer of compacted clay sandwiched between 12-inch layers of sand placed over pyretic tailings. A 4-inch gravel layer was placed on top of the barrier for erosion protection. The barrier reduced oxygen flux by 99.9 percent and excluded 96.1 percent precipitation resulting in an estimated 95.4 percent reduction in the rate of acid generation. This type of capping has a great potential for use on unreclaimed mine spoil or refuse in abandoned surface mining site to control/prevent the PCMD generation.

Mine Seals

Mine seals are used to exclude passage of oxygen (air) to the acid producing environment of underground workings, and may be either dry seals or wet seals. These are used for sealing all mine entries, shafts, and boreholes that are opened to mine workings. Seals should be air-tight to be effective.

Dry seals are constructed by placing suitable material in mine openings to prevent air and water passage in the mine. These seals are suitable for openings where there is no water flow and little danger of a hydrostatic head developing.

Wet seals are constructed to prevent passage of air into the mine while allowing normal mine discharge to flow through the discharge outlet. These seal outlets are provided with air traps. A variation of the wet seal is a hydraulic seal which involves placing a plug in a mine entrance discharging water. The plug prevents discharge and the mine working is flooded. Flooding excludes air from the mine and retards oxidation of acid forming materials. Hydraulic sealing of abandoned underground mines creates an

impoundment in which the mine seals and the mine perimeter serve as an underground dam. The success of hydraulic sealing will depend upon the ability of the entire dam structure to withstand water pressure and control mine water seepage from the seals and the mine perimeter, otherwise, the possibility for a blow-out exists.

Polluted Coal Mine Drainage Treatment Methods Applicability and Limitations

Polluted coal mine drainage (PCMD) treatment methods practiced may be broadly classified as **conventional chemical treatment** or **passive treatment**.

Conventional chemical treatment systems directly apply alkaline chemicals continuously to PCMD discharges for neutralizing mineral acidity, precipitating out metals, and raising pH. This type of treatment system is often called an "Active System". The following six types of chemical treatment are presently being utilized:

- **Limestone;**
- **Hydrated Lime;**
- **Pebble Quick Lime;**
- **Soda Ash Briquettes;**
- **Caustic Soda; and**
- **Ammonia**

Passive treatment systems use more naturally occurring chemical and biological processes that neutralize acidity, decrease metal concentrations, and raise pH. The following seven methods of passive treatment are presently being utilized:

- **Anoxic Limestone Drain (ALD);**
- **Aerobic Wetland;**
- **Anaerobic Wetland;**
- **Successive Alkalinity Producing Systems (SAPS) Or Alkaline Producing System (APS);**
- **Limestone Ponds (LSP);**
- **Reverse Alkalinity Producing System (RAPS); and**
- **Open Limestone Channels (OLC)**
- **Fish Habitat Enhancement With Limestone (FHEWL)**

Conventional Chemical Treatment Systems (Active Systems)

Conventional chemical treatment systems are classified based on the chemical used to treat the PCMD. Six chemical reagents typically and widely used in treating PCMD are: limestone (calcium carbonate), hydrated lime (calcium hydroxide), pebble quick lime (calcium oxide), soda ash briquettes (sodium carbonate), caustic soda (sodium hydroxide), and ammonia (anhydrous ammonia). Each chemical has unique characteristics that make it more or less appropriate for specific conditions. The best choice among the alternatives depends on both technical and economic factors.

- Technical factors include: acidity level of the discharge, rate of flow, type and concentration of metals in the water, rate and degree of pH increase desired, and solubility of chemicals in the water (which influences mechanization).

- Economic factors include: cost of reagents, handling cost (labor, machinery and equipment), and the number of years that treatment will be needed.

The conventional treatment system may require a settling basin or pond where treated PCMD would be detained to allow precipitation of metal hydroxide (sludge). In general, as the pH of the treated water and

its degree of aeration are increased, required residence time in the pond for metal removal would be decreased.

In order to select a specific type of chemical for PCMD treatment, it is necessary to know how the pH of the water governs precipitation of metals contained in the water. Ferrous^{2+} iron changes to bluish-green ferrous hydroxide at or above a pH of 8.5. Ferrous^{2+} iron oxidizes to ferric^{3+} iron in the presence of oxygen and converts to ferric hydroxide, a yellowish orange precipitate, at or above a pH of 3.5. Thus, in the absence of oxygen, poor water primarily containing iron in the ferrous form requires the pH to be 8.5 before ferrous hydroxide precipitates. Consequently, the most efficient way of treating PCMD having a high concentration of ferrous to ferric iron, and then to add a neutralizing chemical to form ferric hydroxide that precipitates at a lower pH. Treatment by this method reduces the amount of neutralizing agent that would otherwise be required to precipitate iron from the water. Precipitation of manganese is variable, but generally soluble manganese^{2+} will precipitate from water at pH 9.0 to 10.0. Aluminum precipitates at a pH of 5.5, but enters solution again at a pH of 8.5 or greater.

It is apparent that the appropriate treatment chemical for PCMD can depend on oxidation status, and metal compositions and concentrations in PCMD.

Characteristics of Chemicals for Active Treatment Systems

Six neutralizing chemicals are typically used for treating PCMD as identified in the previous section. Characteristics of these chemicals relative to their applicability and limitations, are summarizes as follows.

Limestone (calcium carbonate – $CaCO_3$)

- Used for decades to raise pH and precipitate metals in PCMD.
- Cheapest, safest and easiest to handle.
- Will work well with PCMD containing low pH and small concentrations of iron, manganese, and aluminum – precipitating out these metals and raising pH of the water to about 7.0. The maximum attainable pH is 7.4.
- Low solubility in water, (reaction rate is slow).
- If iron concentration is above 5 mg/l, limestone will show a decreased solubility in a short time period due to armoring (coating of ferric hydroxide) of the limestone particle.
- For active system, limestone is not normally used when PCMD acidity values exceed 50 mg/l because of the slow reaction time. Passive systems are designed to accommodate the slow reaction, therefore, limestone can be used.
- If sulfate concentrations in PCMD are above the 2,000 mg/l, then calcium carbonate will react with sulfate to form insoluble gypsum. Gypsum precipitate may clog pipes or other discharge conveyance structures. Not applicable if utilized in In-Stream Limestone Sand Treatment.
- In an anaerobic environment such as an “Anoxic Limestone Drain”, limestone does not armor with metal hydroxides.
- May produce calcium hardness in the treated water.

Hydrated Lime (calcium hydroxide - CaOH)

- Useful safe to handle, and cost effective in large flows and high acidity situations where a lime treatment plant with aerator is constructed to dispense and mix the chemical with water.

- Capital intensive, but cheaper for long-term treatment (greater than 3 years).
- Has been used for 1,000 gpm flow and 2,500 mg/l acidity (extreme condition).
- Has limited effectiveness if a very high pH (pH =9.5) is required to remove manganese.
- If ferrous iron is present, it is cost effective to use hydrated lime I conjunction with an aerator to oxidize the ferrous to ferric iron for precipitation at a lower pH.
- It is generally powdery and hydrophobic, therefore, requiring extensive mixing to make soluble in water.
- With very high sulfate concentration (>2,500 mg/l) may form insoluble gypsum.
- Use is not feasible in remote locations where electricity is not available, since the system requires electricity to power pH sensing metering devices that automatically run the pumps and aerator. Waterpower cannot be used.

Quick Lime (calcium oxide - CaO)

- Recently used in conjunction with the Aqua-Fix Treatment system utilizing a water wheel concept.
- Very reactive; particularly useful for small and/or periodic flows of high acidity. Needs metering equipment.
- Economical, easy to handle, available in palletized form (pebble quicklime).
- Requires no electricity and can be used for treatment in remote places.
- Less costly than ammonia and sodium based neutralizing chemicals.

Soda Ash Briquettes (sodium carbonate – $NaCO_3$)

- Used in remote areas with low flow and low concentrations of acidity and metals.
- Used for short-term applications.
- Easier to handle, but costlier that the calcium based neutralizing chemicals.
- If iron is more than 10 or 20 mg/l, a mixing system will be required to improve efficiency and treatment.
- If ferric iron is a major problem, it can be removed with sodium carbonate with aeration.
- Selection of this material is usually based on convenience rather than cost effectiveness.
- Low solubility relative to other sodium based compounds and is costly.

Caustic Soda (sodium hydroxide – NaOH)

- Commonly used chemical in PCMD treatment in remote locations where no electricity is required.
- Used for temporary treatment particularly in low flows and high acidity situations.

- Extremely soluble, spreads rapidly, raises pH of water very quickly, and is commonly the chemical of choice if the manganese concentration is high.

- Can easily raise the pH to 12 or higher, so, over-application can produce very undesirable situations.

- Suitable for ferrous iron removal, but less cost effective than hydrated lime used in conjunction with an aerator.

- High costs, dangers in handling, and susceptible to freezing during winter seasons.

Ammonia (anhydrous ammonia – NH_3)

- Used in some areas to neutralize acidity and precipitate metals in PCMD.

- Extremely soluble and reacts very rapidly, behaves as a strong base and can easily raise the pH of receiving water to 9.2.

- It is effective for manganese removal (which can occur around pH of 9.5), but is not practical since it requires a large amount of ammonia.

- Is consumes acid (H^+) and generates hydroxyl ions (OH) which for a metal hydroxide precipitate.

- At a pH of 9.2, it buffers the solution to further pH increases, since very high amounts of ammonia must be added to elevate the pH beyond 9.2.

- Caution is needed in using a pH monitoring system at pH levels above 9 since over-applications of ammonia could lead to other water quality problems related to excessive concentrations of unionized ammonia (toxic to fish and aquatic life), nitrate and nitrite. Also may cause acidity downstream.

- Hazards are associated with handling the chemical and uncertainty concerning potential biological reactions.

- Slightly more expensive than hydrated lime, but considerably less expensive than caustic soda or soda ash in neutralizing PCMD.

Methods of Dispensing Alkaline Chemicals for PCMD Treatment

The appropriate method for dispensing or dosing alkaline chemicals to treat PCMD depends o the physical state of the materials to be used for PCMD treatment (i.e., whether the alkaline material to be dosed is solid, slurry, or liquid). The dosing device used also depends on PCMD flow volume and whether the dosing device to be used is for short-term or for long-term treatment.

Liming dosers that have been used successfully to treat PCMD flows are essentially mechanical devices that release powdered or slurried alkaline material into the PCMD flow or streams. These dosers are capable of adjusting dosages in streams with substantial variations in flow and pH (hydrogen ion loads). The most commonly used devices for dosing lime (limestone, quicklime, and hydrated lime) are the electrically powered doser, the waterpower doser, and the rotary drum. Although commercially available dosers can handle varying stream sizes, flows and locations, water powered dosers, rotary drum dosers and even battery powered dosers may be sensitive to freezing during winter months. Additionally, frequent maintenance is required for successful operation of most stream liming dosers.

The three types of liming dosers identified above, the delivery system for limestone fines, and dispensers for caustic soda and soda ash are described in the following subsections.

Electrically Powered Dosers

Electrically powered dosers are composed of an alkaline material storage bin, a feeder screw operated by battery or commercially available power, an automated dose control mechanism, and a distribution pipe that dispenses the powder to the stream. Typically, the limestone /lime feed is automatically regulated by either the water leveling the stream or by pH. As the water level fluctuated, varying amounts of dry powdered material are transported to the storage bin, via the feeder screw, to a conveyor belt. This belt, located within a pipe, transfers the material to the point of distribution above the center of the stream. Some dosers slurry the material with stream water on-site prior to dispensing. Water is pumped from the stream to the slurry tank where it is mixed with the limestone/lime powder. The resultant slurry is pumped to a dispersion well located in the streambed, mixed with additional stream water, and dispersed just below the stream surface. Some dosers store and disperse a commercially prepared slurry of extremely fine limestone powder into streams. The slurry is pumped directly from a storage tank to a Y-connection where it s diluted with water before dispersal. The slurry in the tank is stirred frequently to avoid sedimentation. The most common of these types of dosers are operated by commercially available power. Battery-operated systems are sometimes used in remote locations. Because of power limitations, these are typically smaller installations with storage bins filled manually with bagged alkaline material.

Water Powered Dosers

With water powered dosers, regulated streamflow controls the dispersion of alkaline material. The dosers are installed either in or adjacent to a stream and operate using either bucket feed mechanisms or an apparatus similar to a paddle wheel that turns an auger. The most common water powered doser consists of a storage bin with a small opening in the bottom, a conveyor belt, and a rocker arm with a hammer mechanism at one end, and a tipping bucket at the other end. A small portion of the stream flow is diverted through a pipe or trough into the bucket attached to the rocker arm. As the bucket fills with water, a continuous flow of alkaline material is gravity-fed to a conveyor belt located a few inches below the mouth of the material storage bin. When the bucket if filled with the stream water, it tips over, causing the conveyor belt to spill limestone or lime into the bucket. The movement of the bucket also causes the hammer mechanism to strike the side of the bin. Variations of the feeding mechanism are also commercially available.

MDNR installed four water powered lime dosers along the North Branch Potomac River for stream restoration 3 to 5 years ago. The dosers have been operating approximately 2 years treating PCMD and are producing pH levels of 6.5 or higher.

Rotary Drum Dosers

Rotary drums are cylindrical containers filled with limestone aggregate. They are powered by water diverted from the stream and directed across a sluiceway. In the bottom of the sluice are openings located directly above the each drum. As water falls through the openings in the sluice, blades attached to the exteriors of the drums initiate their rotation, as in a waterwheel. Limestone aggregate is either manually loaded into each drum or automatically fed to the drums through the reciprocating feeder at the bottom of a hopper. In these self-feeding drum systems, a flexible shaft is used to convey power directly from the rotating drum shaft to the reciprocating feeder. The speed at which the drums rotate as well as the amount of aggregate supplied to the drum and ultimately to the stream, are controlled by the volume of water passing through the sluiceway. Thus, within the capacity of the drum, the amount of limestone needed to maintain a target pH / alkalinity is available regardless of flow conditions. Grinding of the limestone aggregate within the drum is a wet autogenous process (i.e., the process uses the aggregate itself as the abrasive agent). The aggregate is then mixed with sluice water entering the drums through tiny holes in the drum exterior. The drum rotation causes abrasion, which produces fines that are released into the stream through the same holes in the drum exterior. Recent developments include the use of screens with various mesh sizes to control particle size. Output of the produced fines in controlled by the screen size and the rotation speed (rpm) of the drum. Several drums can be operated in series, with increased water flow increasing the number of drums in operation.

One limitation of the water-powered drum doser is a minimum flow requirement through the drum. This minimal flow ranges from 0.02 to 5.2 cubic meters per second (derived empirically) depending on the amount of limestone being dosed and the number of drums used.

Delivery System for Limestone Sand

Limestone fines are used to neutralize an acid stream. Information from various studies indicates that sand sized limestone (0.063 to 6.3 mm range particle size) works well in neutralizing stream acid.

The delivery system for limestone fines to be applied directly to streambeds using a dump truck and a dozer. Typically, the amount of fines dumped is two times the acid load in the stream. Limestone fines applied to the streambed may not provide prolonged neutralization and may not successfully treat episodic floods and maintain a pH > 6.0. As such, limestone fines may have to be applied once yearly. However, in some cases, fines have lasted as long as three to four years and continue to provide neutralization.

Since trucks are used for transporting and dumping limestone fines onto the streambed, suitable access to the site is necessary.

Using a dual treatment system, a doser plus streambed application of limestone fines, would make the use of dosing equipment much more feasible for year-round operation of PCMD treatment.

Dispenser for Caustic Soda (NaOH)

The conventional system consists of a horizontally mounted 10,000 gallon storage tank for caustic soda, and a flume-type chemical feeder. Gravity serves as the source of power, with a constant head valve in the chemical feeder controlling a constant feed. Some feel options that are available for this system are: variable chemical feed pump with pH probe controller; solenoid valve with pH probe controller (gravity); and constant chemical feed pump with electric pinch valve and pH probe control.

Soda Ash ($NaCO_3$) Dispenser

Soda ash is produced in a solid pellet form called briquettes, and is used in gravity fed devices composed of a hopper mounted over a basket. The number of briquettes to be used each day is determined by the rate of flow and the quality of water to be treated.

For short-term, isolated cures, some operators use a much simpler system that employs a box or barrel with water inlets and outflows. The operator simply fills the box or barrel with briquettes on a regular basis. This system has less control on the amount of chemical used. This method of treatment is controlled by dissolution of the briquettes. Depending upon the acidity in the drainage, the final treated water may not be within desired pH range. It is also to be noted that drainage with significant iron concentration may cause the briquettes to be coated, rendering them ineffective.

Passive Treatment Systems

Passive treatment of PCMD has been demonstrated as a feasible alternative to conventional chemical treatment in some cases; however, the technology is still evolving. As stated previously, passive treatment systems use more naturally occurring biological and chemical processes such as bacterial sulfate reduction and limestone dissolution, to neutralize acidity and decrease metal concentrations. Compared to conventional chemical treatment, passive methods generally require more land area, but may utilize less costly reagents and require less operational attention and maintenance.

Design of any of the seven passive treatment systems identified previously typically requires an understanding of significant site characteristics such as available area, topographic features, and site hydrology as well as properties of the PCMD to be treated. Of particular concern are the following PCMD properties:

- Flow Rate (maximum and minimum)
- Acidity and alkalinity
- Total Ferric and Ferrous Iron Concentrations
- Manganese Concentrations
- Aluminum Concentrations
- Dissolved Oxygen Content
- Suspended Solids Content
- Oxidation Reduction Potential (ORP)
- pH

The performance of systems using limestone for treatment are impacted by the calcium carbonate content of the limestone and limestone dissolution rate; therefore, these parameters also require consideration during design.

Anoxic Limestone Drain (ALD)

An ALD is a buried bed of crushed limestone aggregate through which acidic water can be diverted to increased pH and alkalinity. The drain is designed to maintain an anoxic environment within the limestone. Ideally, the drain should be a pool and should be completely full so that as water is added at the inlet end, water at the outlet end overflows through an airtrap outlet (pipe with double elbow). In plan view, the shape of an ALD typically is narrow (typically 2 to 9 feet) and elongated like a drain. Lengths ranging from 100 to 2,000 feet have been reported. Most drains are 2 to 5 feet deep.

ALD's raise pH and add alkalinity to acid water under anoxic conditions. Once water exists the drain, the water is aerated and sufficient area must be provided for metal oxidation, hydrolysis, and precipitation to occur. The type and size of area required (e.g., ditch, settling pond, or wetland) depend on metal content of the water.

ALD's are applicable for water having a low dissolved oxygen content which can be maintained when the water is intercepted by the drain. They also may be applicable for water having a dissolved oxygen content greater than 1 mg/l if the metals content is low.

Limitations of the ALD technology are:

- Limestone and mine water must be kept anoxic.
- DO is < or = to 1 mg/l unless metal content is very low.
- Oxidation-reduction potential (ORP) measurement, Eh, is zero or less.
- Ferric iron content is < or = to 25 mg/l.
- Aluminum contents is < 25 mg/l.
- Acidity is < or = to 200 mg/l. The assumption is made that 250 mg/l alkalinity are produced.
- Generates alkalinity in water of up to 300 mg/l when functioning properly.
- Need facility at discharge end for metals precipitation. Sufficient area must be available for metal precipitation.
- Typically limited to flow rates < or = to 100 gpm. ALD's may be feasible for flow rates greater than 100 gpm if space is available and the water has low levels of iron, manganese, and aluminum. Others have reported experience with flow rates up to 500 gpm. Higher success rates have been demonstrated with flow rates < or = to 100 gpm.

- The limestone is subject to armoring and clogging. Armoring reduces limestone dissolution by 80% (will dissolve at 20% maximum efficiency when armored).

- If internal water velocities are too slow to carry aluminum hydroxides out of the drain, the drain will be subject to clogging.

- If sulfate is present in concentrations much above 2.000 ppm, it will begin precipitating as gypsum.

- Maximum alkaline generation requires 14 - 23 hours retention time. Maximum retention time is recommended if chemical/biological reduction is necessary.

ALD's have been used for PCMD treatment since the mid 1980's. Skousen reported in 1991 that the technology was relatively recent discovery and that 50 ALD's had been installed in the Appalachian states as of fall, 1991. An ALD designed by Michael Baker, Jr., Inc. was installed in Webster, West Virginia in 1984 to treat PCMD from an abandoned coal refuse site on an experimental basis. This ALD is still treating site PCMD effectively.

Aerobic Wetland

An aerobic wetland is a simple wetland that is used to collect water and provide residence time so that metals in the water can precipitate. Consequently, they promote mixed oxidation and hydrolysis reactions. The water usually has net alkalinity and metals precipitate as the water is held within the wetland. Alkalinity is needed to not only elevate pH and thereby facilitate metals precipitation, but also to avoid a major pH drop due to ferrous iron oxidation, hydrolysis, and precipitation.

Constructed aerobic wetlands typically consist of: 1) a basin having a natural or constructed low permeability barrier of soil or geosynthetic material to minimize seepage, 2) the substrate such as soil or another suitable medium overlying the barrier to support emergent vegetation (e.g., cattails), and 3) water flowing over the soil surface. Sometimes aerobic wetlands are equipped with aeration structures such as a rock-lined waterfall or a stair-step structure to increase the dissolved oxygen content of the inflowing water.

Skousen reports that wetland species are planted in these systems for aesthetics and to add some organic matter, but the organic matter is not necessary to the function of the system. However, Skousen also reports that the most important role wetland plants serve in PCMD treatment systems may be their ability to stimulate microbial processes. Plants provide sites for microbial attachment, release oxygen from their roots, and supply, organic matter for heterotrophs.

Aerobic wetlands are applicable when the inflowing water is net alkaline and sufficient area is available for wetland installation.

Limitations of this technology are:

- After PCMD passes through this type of wetland, the water may still require additional chemical treatment but may require a lower amount of chemical.

- Net alkaline water is required (alkalinity > acidity). Acidic if pre-treatment precipitation is required.

- A pH of > or = to 4.5 is recommended.

- Because aeration only provides enough oxygen to oxidize about 50 mg/l of ferrous iron to ferric iron, water with higher concentrations of ferrous iron will require operation of a series of aeration unit-wetland cell combinations. In this case, if a series of aeration units – wetland cell combinations are provided, then ferrous iron < 50 mg/l is OK.

- Can require considerable area, depending on water flow rates and metal concentrations and therefore is restricted by available area at site.

- Typically, gently sloping sites will be required. Otherwise, a considerable amount of earthwork may be required.

- The wetlands system eventually will fill up with metal precipitates and may require reconstruction (removal of sediments) or replacement. The rate at which precipitates will accumulate is site and PCMD specific but measurements at wetlands for PCMD treatment in Ohio and Pennsylvania indicate increases in sludge depth of 3 to 4 cm/yr, respectively.

- Aerobic Fe removal requires a retention time of 24 – 48 hours.

Wetlands have been used for decades in the treatment of municipal wastewater, but only within the last 10 years have they received serious attention for treatment of PCMD. Researchers have documented many sites where PCMD has been improved after passing through natural and constructed wetlands.

Anaerobic Wetland

Anaerobic wetlands are referred to as "compost wetlands". A compost wetland adds alkalinity and is provided when the mine water does not have enough alkalinity to buffer the acidity produced by metal hydrolysis reactions. This type of wetland is similar to the simple aerobic wetlands except that it has a thick organic substrate through which inflowing water can be directed. The substrate typically has a high calcium carbonate content, approximately 10% measured on a dry weight basis. Sometimes a layer of crushed limestone is included below the organic substrate and incoming flow is directed into the limestone. Flow then emanates upward into the organic compost layer (also laterally outward if the limestone does not extend across the full length of the wetland).

Four processes occur within a constructed wetland of this type, each having the ability to remove metals from acid drainage. Metal removal results from: 1) plant intake, 2) adsorption to organic substrates, 3) oxidation and hydrolysis, and 4) microbial reduction processes through the metabolism of anaerobic bacteria. Bacteria reduce sulfate into sulfide which can then combine with hydrogen and iron. The net gain is an increase in pH and alkalinity, and a decrease in metals and acidity. Thus, compost wetlands generate alkalinity through a combination of bacterial activity (bacterial sulfate reduction) and carbonate dissolution.

Anaerobic wetlands are applicable when the inflowing water is net acidic and sufficient area is available for wetland installation.

Limitations of this technology are:

- If the pH of the inflow is < 3, limestone addition to the substrate will be required.

- DO > 1 - < or = to 5 mg/l will be required if a limestone layer is provided below the organic compost and inflow is directed into the top of the system. Organic layer strips DO and reduces sulfate concentration.

- Ferric iron < 50 mg/l unless series of aeration unit – wetland cell combinations are provided.

- Wetland performance is affected by temperature. Lower rates of acidity and metal removal occur in winter than in summer, particularly if subsurface flow is not achieved.

- Can require considerable area, depending on water flow rates and metal concentrations and therefore is restricted by available area at site.

- Typically, gently sloping sites will be required. Otherwise, a considerable amount of earthwork may be required.

- Freeboard should provide for accumulation of metals and additional organic matter. Although some organic matter will be added to the wetland naturally, the filtering capacity of the organic substrate will ultimately be finite as all exchange and complexation sites become metal saturated. Substantial inputs of organic matter could be required. Also, accumulation of sediments over and within the substrate could reduce substrate permeability.

- The wetland system eventually will fill up with metal precipitates and may require reconstruction (removal of sediments) or replacement.

- Maximum alkaline generation requires 14 - 23 hours retention time. Maximum retention time is recommended if chemical/biological reduction is necessary.

As stated previously, wetlands have been considered and implemented for PCMD treatment for the last 10 years.

Alkalinity Producing System Or Successive Alkalinity Producing Systems (APS Or SAPS)
An APS combines the ALD and anaerobic wetland technologies and is used when the raw water is acidic and has a dissolved oxygen (DO) content > or = to 1 mg/l, unless the metals content is very high. Organic layer strips DO and reduces sulfate concentration. Basically, an APS is a pond having the following materials installed at the bottom of the pond (listed in ascending order): 1) pipe underdrain system, 2) limestone layer overlying and surrounding the pipe system, and 3) layer of organic material. The pond is designed to provide for 4 to 8 feet of ponded water over the organic material. The semi-aerated water is introduced at the top of the pond. Water percolates through the organic material under its own head (4 to 8 feet of water) and any ferric iron in the water is either filtered out by the organic material or reduced by microbial iron reduction to ferrous iron. The reduced (oxygen poor) water then continues downward into the limestone, picking up additional alkalinity by limestone dissolution. The water then outflows through the pipe underdrain at the bottom of the APS. As with the ALD technology, the outflow is then aerated and metals removed by a sedimentation pond, wetlands, etc. For applications involving highly acidic water and/or area limitations, successive Alkalinity Producing System (i.e., APS followed by a sedimentation pond/wetland), SAPS, are used.

Limitations of this technology are:

- DO > or = to 1 mg/l will be required unless the metals content is very high. Organic layer strips DO and reduces sulfate concentration.

- The organic layer must be porous and may limit discharge from the facility.

- Can require considerable area depending on water flow rates, net acidity, and metal concentrations, and consequently, the need for a system of successive APS (SAPS) and, therefore is restricted by available area at site.

- Typically, gently sloping sites will be required. Otherwise, a considerable amount of earthwork may be required.

- Freeboard should for accumulation of metals and additional organic matter. The filtering capacity of the organic substrate will ultimately be finite as all exchange and complexation sites become metal saturated. Substantial inputs of organic matter could be required. Also, accumulation of sediments over and within the substrate could reduce substrate permeability.

- Maximum alkaline generation requires 14 - 23 hours retention time. Maximum retention time is recommended if chemical/biological reduction is necessary.

Kepler and McCleary and Skousen have reported four successful PCMD passive treatment systems incorporating the APS/SAPS technology. The first system reportedly was installed in 1989.

Limestone Pond(s) (LSP)

A LSP is a relatively new PCMD passive treatment method whereby a treatment pond is constructed over an acidic seep or other acidic discharge for neutralization purposes. Limestone is placed at the bottom of the pond and water from the seep flows upward through the limestone. A free water surface is maintained over the limestone. A water depth of 4 to 10 feet is typical and is based on site-specific features such as topography and characteristics of the water source.

LSP's raise pH and add alkalinity to acid water. They operate under anoxic conditions if the limestone is kept inundated. Once water exits the pond, the water is aerated and sufficient area must be provided for metal oxidation, hydrolysis, and precipitation to occur. The type and size of area required (e. g., ditch, settling pond, or wetland) depend on the metals content of the water.

LSP's are applicable when the raw water is acidic, has a low dissolved oxygen content and the source(s) is located at the pond site. A LSP may be applicable for water having a dissolved oxygen content greater than 1 mg/l if the metals content is low.

Limitations of this technology are:

- Limestone must be kept inundated with the mine water.
- DO is < or = to 1 mg/l unless metal content is very low.
- Oxidation-reduction potential (ORP) measurement, Eh, is zero or less.
- Ferric iron content is < or = to 25 mg/l.
- Aluminum content < 25 mg/l.
- Acidity < or = 200 mg/l. The assumption is made that 250 mg/l alkalinity are produced.
- Need facility at discharge end for metals precipitation. Sufficient area must be available.
- Flow rate limitations presented for an ALD apply to the LSP.
- The limestone is subject to armoring and clogging. Armoring reduces limestone dissolution by 80%. If armoring/clogging occurs, the limestone will require periodic stirring with a backhoe to either uncover the limestone from precipitates or to knock or scrape off the precipitates. The pond width and depth should be selected to allow a backhoe to all areas of the pond bottom.
- Maximum alkaline generation requires 14 - 23 hours retention time. Maximum retention time is recommended if chemical/biological reduction is necessary.

Reverse Alkalinity Producing System(s) (RAPS)

A RAPS represents a combination of the APS (Alkalinity Producing System) and LSP (Limestone Pond) technologies. It consists of a pond installed over a seep or water discharge point similar to a LSP except that the RAPS is designed for raw water that is <u>not</u> anoxic. A layer of organic material is placed in the bottom of the pond and is overlain by a layer of limestone. Since water flows up from the pond bottom (below the organic material), metals in the raw water can be filtered and adsorbed as they pass through the organic material, microbial iron and sulfate reduction can occur, and the oxygen content of the water can be decreased by microbial decomposition of the organic material. The water then continues upward through

the limestone, picking up more alkalinity. Treated water flows out of the RAPS through an open channel spillway.

Once water exits the RAPS, the water is aerated and sufficient area must be provided for metal oxidation, hydrolysis, and precipitation to occur. The type and size of area required (e.g., ditch, settling pond, or wetland) depend on the metals content of the water.

A RAPS is applicable when the raw water is acidic, has a dissolved oxygen content > or = to 1 mg/l, unless the metals content is very high, and when the PCMD source(s) is located at the pond site. Organic layer strips DO and reduces sulfate concentration.

Limitations of this technology are:

- DO > or = to 1 mg/l will be required unless the metals content is very high. Organic layer strips DO and reduces sulfate concentration.
- The organic layer must be porous.
- Typically, gently sloping sites will be required. Otherwise, a considerable amount of earthwork may be required.
- Can require considerable area depending on water flow rates, net acidity, and metal concentrations, and consequently, the need for a system of successive RAPS and, therefore is restricted by available area at site.
- The filtering capacity of the organic substrate will ultimately be finite as all exchange and complexation sites become metal saturated. Reductions in permeability leading to clogging will occur. When this occurs, replacement of the organic material and overlying limestone will be required.
- Maximum alkaline generation requires 14 - 23 hours retention time. Maximum retention time is recommended if chemical/biological reduction is necessary.

Historical data documenting use of the RAPS technology has not been reported.

Open Limestone Channel(s) (OLC)

OLC's were introduced in a fall 1994 Green Lands article as another possible solution of introducing alkalinity to acid water. Long channels lines with limestone are used to convey acidic water to a stream or other discharge point. Culverts, diversion/collection channels, stream channel, etc., may be lined with the finely or coarsely graded crushed limestone. Water neutralization and some metals precipitation occur within the channel; however, depending on the metals content of the raw water, discharge will have to pass through a sedimentation pond or aerobic wetland prior to discharge to the receiving stream.

OLC's are applicable when the raw water is acidic and where long channels can be constructed between the source and receiving stream or other point of discharge.

Limitations of this technology are:

- Sufficient distance must be available between the source and the ultimate point of discharge to facilitate construction of a channel long enough to provide the retention time needed for neutralization. Otherwise, discharge from the channel will have to be directed to another type of treatment facility for alkalinity addition (e.g., anaerobic wetland, APS, etc.).
- Can require considerable area depending on water flow rates, net acidity, and metal concentrations, and consequently, the need for a lengthier system and, therefore is restricted by available area at site.

- Channel length and width restrictions are based on flow and required contact time. 100% neutralization can be achieved with a 3 hour residence time; 90% with 1 hour.

- Some metals precipitation will occur within the channel and armor the limestone, thereby reducing the effectiveness of the limestone.

- Sufficient metals precipitation may not/should not occur within the channel; therefore, a settling pond or aerobic wetland should be provided at the downstream end of the channel.

- May need facility at discharge end for metals precipitation. Sufficient area must be available.

- The limestone is subject to armoring, clogging, and even burial in gently sloping channel sections where water velocities are low. Armoring reduces limestone dissolution by 80%. If armoring/clogging occurs and system performance is reduced to unacceptable levels, the limestone will have to be stirred with a backhoe to either uncover the limestone from precipitates or to knock or scrape off the precipitates.

- Recommended gradient > or = to 90%.

Ziemkiewicz, Skousen, and Lovett surveyed five abandoned mine land sites in northern West Virginia where channels of open limestone were used to conduct acid water from the sites. Acidity reduction was noted at all of the sites and some of the channels achieved 100% acidity reduction. All of the channels are relatively short (<800 ft.).

Fish Habitat Enhancement With Limestone (FHEWL)

FHEWL is a relatively new treatment technology developed by the West Virginia Division of Environmental Protection's Stream Restoration Group. FHEWL takes into account that at-source treatment alternatives may be ineffective in treating net acidic PCMD; cost inefficient; and require significant monitoring, operations, and maintenance that overall does not support cost efficacy. At-source treatment may not be warranted, due to area available at the site, cost, and the flow and chemical characteristics of the PCMD discharges.

FHEWL treatment technologies are to be constructed in-stream, for the primary purpose of acid neutralization and alkaline addition, while maintaining and enhancing fish and wildlife habitat and the very fragile aquatic ecosystem. These technologies are to be constructed in an environmentally benign fashion and need to be considerate of "natural stream design" recommendations and best management practices of stream morphology specialists.

When dealing with net acidic PCMD discharges, where no at-source treatment is being considered, it may be necessary to construct OLC's to pre-treat those discharges before they enter the receiving stream(s). Although this may not be necessary or warranted, due to area available at the site, cost, and the flow and chemical characteristics of the PCMD discharges, if at all possible, collect the discharges and channel them through limestone for any acid neutralization and/or alkaline addition possible.

The types of FHEWL treatment technologies are as follows:

- K-Dams;
- Check-Dams;
- Wing-Dams;
- Boulder Placements;
- Terrace Structures;
- Etc.

By incorporating a > or = to 95% $CaCO_3$ aggregate into the design of these FHEWL treatment structures, the acid neutralization and alkaline generation potential is realized. At the same time, fish habitat is enhanced through the creation of natural pools and riffles, as well as, oxygenating the water.

West Virginia Division of Environmental Protection
Office of Abandoned Mine Lands & Reclamation
Stream Restoration Group's

HOLISITIC WATERSHED APPROACH PROTOCOL

I. Define the *study area*.

- Select mainstem stream and determine watershed boundary.
  - Categorize Abandoned Mine Lands Inventory by Hydrologic Unit Code Regions.
  - Implement priority ranking methodology of Hydrologic Unit Code Regions based upon weighted criteria.
    - Weighted criteria shall consist of:
      -

II. Establish *comprehensive monitoring network* within the *study area*.

- Select and number stream sampling stations.
  - Select mainstem stream sampling stations representing mainstem stream segments.
  - Select all mainstem tributary sampling stations at the mouth locations and at extensive locations throughout the mainstem tributary stream reach.
  - Establish project name and nomenclature.
  - Number all stream sampling stations in ascending order, beginning with the most downstream station.

III. Obtain coordinates and map *comprehensive monitoring network* for Geographical Information System (GIS) input.

- Process Global Positioning System (GPS) Data
  - Collect sampling station positions using Global Positioning System data capture equipment.
  - Update Stream Restoration Group Project Log.
    - Record project name, date of Global Positioning System coordinate collection.
  - Correct Global Positioning System data.
  - Enter Coordinates into Q&A database.
  - Update Stream Restoration Group Project Coordinates Log
    - Record project name and nomenclature; sample number, latitude, and longitude; and horizontal precision.

- Provide Q&A database to TAGIS for Geographical Information System (GIS) analysis.
- Generate project map of all sampling stations.

IV. Implement sampling sweeps of the *comprehensive monitoring network*.

- Conduct *Water Quality Study* sweeps three to six times spanning a range of hydrologic and climatologic conditions.
  - Prepare chain of custody (COC) form for laboratory.
    - Chain of Custody form includes project nomenclature and name, station number and description, and required field and laboratory analyses.
      - Stream sampling variables include: flow; field temperature, pH, and specific conductivity; lab pH, specific conductivity, total hot acidity, alkalinity, sulfate, total iron, aluminum, and manganese.
  - Prepare sampling equipment for field use.
    - Calibrate electronic field equipment.
    - Gather all necessary equipment, forms, maps, keys, and personal needs for sampling.
  - Prepare sampling stations for water sample collection.
    - Stake sampling stations as close to collection point as possible.
      - Label stake with sampling station number.
  - Perform water sample collection.
    - Collect stream water sample for laboratory analysis employing "grab" sample method. Sample is collected in the middle of the stream channel, at mid depth, downstream of mixing zone of any influx.
      - Label collection bottle with sample station nomenclature and number, date and time, and preservative.
      - Collect and refrigerate unpreserved water sample for laboratory analyses of pH, specific conductivity, total hot acidity, alkalinity**,** and sulfate.
      - Collect nitric acid preserved water sample for laboratory analyses of total iron, aluminum, and manganese.
  - Perform field measurements.
    - Obtain insitu values of water quality measurements at all sampling stations.
      - Measure temperature, pH, and specific conductivity.
    - Obtain stream flow.
      - Measure uniform width segments of the total water cross section utilizing a tagline.
        - Each segment should represent no more than 10 percent of the total cross section of the water in the channel.
      - Record average width of segments (tenths of feet).

- Average width = (distance from previous measurement point + distance to next measurement point ÷ 2)
- Measure water depth at the water edges and at each uniform width segment between, utilizing a self adjusting wading rod.
- Record water depth (tenths of feet).
- Measure water velocity at water edges and at each uniform width segment between, utilizing a Marsh-McBirney flow meter.
- Record velocity (feet per second)
- Calculate and record total flow (cubic feet per second).
  - Σ (average width x depth x velocity) = flow

- Complete Stream Restoration Group Acid Mine Drainage Assessment (AMDA) Form.
  - Record field notes.
  - Sketch and photograph sampling station.
- Update Stream Restoration Group Project Log.
  - Record project name, date of collection, number of samples, number of sampling personnel, hours sampled, hours traveled to site, and downstream flow measurement.

- Conduct *Biological and Physical Study* one time between April and November.
  - Perform stream habitat assessments and qualitative benthic macroinvertebrate surveys at all stream sampling stations.
    - Habitat assessment and benthic macroinvertebrate survey comply with United States Environmental Protection Rapid Bioassessment Protocol II or Izaak Walton League of America Save Our Streams Protocol.
  - Update Stream Restoration Group Project Log.
    - Record project name and date of bioassessment.
  - Perform fish survey at selective stream sampling stations only.

V. Review all data collected. (If watershed is large continue. If watershed is small skip to VIII.)

- Analyze changes in tributary and mainstem stream segments and compare tributaries.
  - Represent *Water Quality Study* data graphically.
  - Compare *Biological and Physical Study* data.

VI. Establish *streamlined monitoring network* within the *comprehensive monitoring network*.

- Select and number stream sampling stations.
  - Select mainstem stream sampling stations representing mainstem stream segments.

- Select all mainstem tributary sampling stations at the mouth locations only.
- Stream sampling station numbers remain the same as in *comprehensive monitoring network.*

VII. Implement sampling sweeps of *streamlined monitoring network*.

- Conduct *Water Quality Study* sweeps three to six times spanning a range of hydrologic and climatologic conditions.
  - Prepare chain of custody (COC) form for laboratory.
    - Chain of Custody form includes project nomenclature and name, station number and description, and required field and laboratory analyses.
      - Stream sampling variables include: flow; field temperature, pH and specific conductivity; lab pH, specific conductivity, total hot acidity, alkalinity, sulfate, total iron, aluminum, and manganese.
  - Prepare sampling equipment for field use.
    - Calibrate electronic field equipment.
    - Gather all necessary equipment, forms, maps, keys, and personal needs for sampling.
  - Perform water sample collection.
    - Collect stream water sample for laboratory analysis employing "grab" sample method. Sample is collected in the middle of the stream channel, at mid depth, downstream of mixing zone of any influx.
      - Label collection bottle with sample station nomenclature and number, date and time, and preservative.
      - Collect and refrigerate unpreserved water sample for laboratory analyses of pH, specific conductivity, total hot acidity, alkalinity**,** and sulfate.
      - Collect nitric acid preserved water sample for laboratory analyses of total iron, aluminum, and manganese.
  - Perform field measurements.
    - Obtain insitu values of water temperature, pH, and specific conductivity.
    - Obtain stream flow.
      - Measure uniform width segments of the total water cross section utilizing a tagline.
        - Each segment should represent no more than 10 percent of the total cross section of the water in the channel.
      - Record average width of segments (tenths of feet).
        - Average width = (distance from previous measurement point + distance to next measurement point ÷ 2)
      - Measure water depth at the water edges and at each uniform width segment between, utilizing a self adjusting wading rod.

- Record water depth (tenths of feet).
- Measure water velocity at water edges and at each uniform width segment between, utilizing a Marsh-McBirney flow meter.
- Record velocity (feet per second)
- Calculate and record total flow (cubic feet per second).
  - Σ (average width x depth x velocity) = flow

- Complete Stream Restoration Group Acid Mine Drainage Assessment (AMDA) Form.
  - Record field notes.
  - Sketch and photograph sampling station.
- Update Stream Restoration Group Project Log.
  - Record project name, date of collection, number of samples, number of sampling personnel, hours sampled, hours traveled to site, and downstream flow measurement.

VIII. Review all data collected.

- Analyze changes in tributary and mainstem stream segments and compare tributaries.
  - Represent *Water Quality Study* data graphically.
  - Compare *Biological and Physical Study* data.
  - Compare mainstem tributaries with respect to degree of impairment.

IX. Define *focus study area*.

- Select impaired tributary within *comprehensive monitoring network* and determine watershed boundary.
  - Implement priority ranking methodology of impaired mainstem tributaries based upon weighted criteria.
    - Weighted criteria shall consist of:
      -

X. Establish *focus area monitoring network* within the *focus study area*.

- Locate polluted coal mine drainage source sampling stations within impaired tributary watershed.
  - Research existing data.
    - Search historical maps, reports, and data.
    - Communicate with local citizen groups or individuals.
    - Communicate with State, Federal, Local agencies.
    - Communicate with local Private Industry.
    - Review Abandoned Mine Lands Inventory, and OSM51/ Environmental Assessments.

- Communicate with Abandoned Mine Lands North/South Planner to determine water quality projects.
- Obtain Landowner Permission for Sampling Rights of Entry for potential water quality projects.
- Field review entire impaired tributary watershed.
  - Field review inventoried Abandoned Mine Lands water quality projects within impaired tributary watershed with Abandoned Mine Lands North/South Planner.
    - Establish Project Point of Contact (PPOC).
    - Establish project name and nomenclature.
    - Establish project boundaries.
    - Establish source sampling stations.
      - Number source sampling stations within each project beginning with 100 and incrementing by hundreds to allow numbering space for additional stations which may be encountered.
      - Complete Stream Restoration Group Acid Mine Drainage Assessment (AMDA) Form.
        - Record field notes.
        - Sketch and photograph project area.
    - Field review remainder of impaired tributary watershed to locate additional polluted coal mine drainage sources that are not associated with inventoried Abandoned Mine Lands water quality projects.
      - Establish Project Point of Contact (PPOC).
      - Establish project name and nomenclature.
      - Establish project boundaries.
      - Establish source sampling stations.
        - Number source sampling stations within each project beginning with 100 and incrementing by hundreds to allow numbering space for additional stations which may be encountered.
      - Complete Stream Restoration Group Acid Mine Drainage Assessment (AMDA) Form.
        - Record field notes.
        - Sketch and photograph project area.
      - Report projects to Abandoned Mine Lands North/South Planner and Planning Administrator.
- Select and number stream sampling stations throughout impaired tributary watershed.
  - Select impaired tributary sampling stations at mouth location and at extensive locations throughout the tributary stream reach, including stations upstream and downstream of polluted coal mine drainage influx.
  - Select receiving stream sampling stations upstream and downstream of the confluence with the impaired tributary.

- Number all stream sampling stations in ascending order, beginning with the most downstream station.
- Add projects to Stream Restoration Group Water Quality Assessment Index (WQAI).
  - Include project name and nomenclature, point of contact, water quality assessment type, number of monitoring points, hydrologic region, watershed, receiving stream, 7.5' USGS topographic map, purpose of assessment, county, coal seam, priority list date, and sampling Right of Entry completion date.

XI. Obtain coordinates and map *focus area monitoring network* for Geographical Information System (GIS) input.

- Process Global Positioning System (GPS) Data:
  - Collect sampling station positions using Global Positioning System data capture equipment.
  - Update Stream Restoration Group Project Log.
    - Record project name and date of Global Positioning System coordinate collection.
  - Correct Global Positioning System data.
  - Enter Coordinates into Q&A database.
  - Update Stream Restoration Group Project Coordinates Log
    - Record project name and nomenclature; sample number, latitude, and longitude; and horizontal precision.
  - Provide Q&A database to TAGIS for Geographical Information System (GIS) analysis.
- Generate project map of all sampling stations.

XII. Implement sampling sweeps of *focus area monitoring network*.

- Conduct *Water Quality Study* sweeps two to three times spanning a range of hydrologic and climatologic conditions.
  - Obtain project reclamation number.
  - Prepare chain of custody (COC) form for laboratory.
    - Chain of Custody form includes project nomenclature and name, project reclamation number, station number and description, and required field and laboratory analyses.
      - Stream sampling variables include: flow; field temperature, pH specific conductivity and dissolved oxygen; lab pH, specific conductivity, total hot acidity, alkalinity, sulfate, total iron, calcium, aluminum, and manganese.
      - Pollution source sampling variables include: flow; field temperature, pH, specific conductivity, and dissolved oxygen; lab

pH, specific conductivity, total hot acidity, alkalinity, sulfate, total iron, ferrous and ferric iron, calcium, aluminum, and manganese.

- Prepare sampling equipment for field use.
  - Calibrate electronic field equipment.
  - Gather all necessary equipment, forms, maps, keys, and personal needs for sampling.
- Prepare sampling stations for water sample collection.
  - Stake stream and source sampling stations as close to collection point as possible.
    - Label stake with sampling station number.
  - Dig collection basin at pollution source origin.
- Perform water sample collection.
  - Collect stream water sample for laboratory analysis employing "grab" sample method. Sample is collected in the middle of the stream channel, at mid depth, downstream of mixing zone of any influx.
    - Label collection bottle with sample station nomenclature and number, date and time, and preservative.
    - Collect and refrigerate unpreserved water sample for laboratory analyses of pH, specific conductivity, total hot acidity, alkalinity**,** and sulfate.
    - Collect nitric acid preserved water sample for laboratory analyses of total iron, aluminum, calcium, and manganese.
  - Collect pollution source water sample at origin. (When several seeps co-mingle, it is necessary to collect a sample of the combined discharge.)
    - Label collection bottle with sample station nomenclature and number, date and time, and preservative.
    - Collect and refrigerate unpreserved water sample for laboratory analyses of pH, specific conductivity, total hot acidity, alkalinity**,** and sulfate.
    - Collect nitric acid preserved water sample for laboratory analyses of total iron, aluminum, calcium, and manganese.
    - Collect and refrigerate hydrochloric preserved water sample for laboratory analyses of ferrous and ferric iron.
      - Ferrous and ferric iron analyses are not necessary at source stations when the water is impounded and the origin of the source is not "free flowing" accessible.
- Perform field measurements.
  - Obtain insitu water quality measurements at all sampling stations.
    - Measure temperature, pH, specific conductivity, and dissolved oxygen at all stream sampling stations.
    - Measure temperature, pH, specific conductivity, and dissolved oxygen at source sampling stations.

- Dissolved oxygen measurement is not necessary at source stations when the water is impounded and the origin of the source is not "free flowing" accessible, or the origin is not inseparable from other sources.

- Obtain stream flow.
  - Measure uniform width segments of the total water cross section utilizing a tagline.
    - Each segment should represent no more than 10 percent of the total cross section of the water in the channel.
  - Record average width of segments (tenths of feet).
    - Average width = (distance from previous measurement point + distance to next measurement point ÷ 2)
  - Measure water depth at the water edges and at each uniform width segment between, utilizing a self adjusting wading rod.
  - Record water depth (tenths of feet).
  - Measure water velocity at water edges and at each uniform width segment between, utilizing a Marsh-McBirney flow meter.
  - Record velocity (feet per second)
  - Calculate and record total flow (cubic feet per second).
    - Σ (average width x depth x velocity) = flow
- Obtain source flow. (When several seeps co-mingle, it is necessary to measure the flow of the combined discharge.)
    - Dig exit channel from source collection basin.
      - Channel must be wide enough to accommodate wading staff base.
      - Water in channel must be deep enough to submerge velocity sensor.
    - Measure uniform width segments of the total water cross section utilizing a tagline.
      - Each segment should represent no more than 10 percent of the total cross section of the water in the channel.
    - Record average width of segments (tenths of feet).
      - Average width = (distance from previous measurement point + distance to next measurement point ÷ 2)
    - Measure water depth at the water edges and at each uniform width segment between, utilizing a self adjusting wading rod.
    - Record water depth (tenths of feet).
    - Measure water velocity at water edges and at each uniform width segment between, utilizing a Marsh-McBirney flow meter.
    - Record velocity (feet per second)
    - Calculate and record total flow (cubic feet per second).
      - Σ (average width x depth x velocity) = flow
- Complete Acid Mine Drainage Assessment (AMDA) Form.

- Record field notes.
- Sketch and photograph sampling station.

- Update Stream Restoration Group Project Log.
  - Record project name, date of collection, number of samples, number of sampling personnel, hours sampled, hours traveled to site, downstream flow measurement.
  - Include project status for source sampling stations.

- Conduct *Biological and Physical Study* one time between April and November.
  - Perform stream habitat assessments and qualitative benthic macroinvertebrate surveys upstream and downstream of polluted coal mine drainage project areas.
    - Habitat assessment and benthic macroinvertebrate survey comply with United States Environmental Protection Rapid Bioassessment Protocol II or Izaak Walton League of America Save Our Streams Protocol.
  - Update Stream Restoration Group Project Log.
    - Record project name and date of bioassessment.

XIII. Review data.

- Analyze *focus area monitoring* network data.
  - Represent *Water Quality Study* data graphically and tabularly.
- Field review *focus area* pollution sources with all Stream Restoration Group members.
  - Review Stream Restoration Group Acid Mine Drainage Assessment (AMDA) Form notes and sketches.

XIV. Report findings.

- Prepare preliminary *Water Quality Study* report of findings and suggestions.
  - Determine extent of impairment polluted coal mine drainage contributes to the *focus area* impaired tributaries.
  - Determine site specific polluted coal mine drainage treatment technology for the sources at each project area.
    - Evaluate chemical suitability of selected polluted coal mine drainage treatment technology.
      - Apply Stream Restoration Group Polluted Coal Mine Drainage Remediation criteria flow chart.
        - Reference variables include alkalinity, acidity, dissolved oxygen, total iron, ferrous and ferric iron, and aluminum.
    - Evaluate physical suitability of selected polluted coal mine drainage treatment technology.
      - Reference variables include flow and geography.

- Determine instream polluted coal mine drainage treatment technology for stream benefits in addition to, or in lieu of site specific polluted coal mine drainage treatment.
    - Reference variables include acidity and flow.
- Submit *Water Quality Study* report to Abandoned Mine Lands Chief and Policy Committee for review and concensus selection of Abandoned Mine Lands project sites and polluted coal mine drainage treatment technology methods within the *focus area*.

XV. Modify *focus area monitoring network* and implement three to six additional sampling sweeps.

-
- Update Stream Restoration Group Water Quality Assessment Index (WQAI).
    - Add project reclamation number and monitoring starting date.
- Report any portion of project for which polluted water abatement appears infeasible to the Abandoned Mine Lands Design Administrator.
    - Infeasible polluted water abatement areas include: seeps located at or near the stream edge, and seeps or mine openings discharging extremely small flows, if the seep, mine opening discharge, or receiving stream is inaccessible to earthmoving equipment.
- Cease sampling of any portion of project for which polluted water abatement appears infeasible, unless otherwise instructed by the Abandoned Mine Lands Design Administrator.
- Report any additional polluted coal mine drainage sources found on project sites to Abandoned Mine Lands North/South Planner.

XVI. Report findings.

- Prepare preliminary pre-design *Water Quality Study* report.
    - Participate in on-site mapping meeting upon request of Abandoned Mine Lands Project Manager.
    - Participate in on-site pre-issuance meeting upon notification from Abandoned Mine Lands Project Manager.
    - Update Stream Restoration Group Water Quality Assessment Index.
        - Record name of project design consultant upon notification from Abandoned Mine Lands Construction Administrator.
    - Participate in any meetings relative to the project upon request of Abandoned Mine Lands Project Manager.
    - Incorporate on-site findings and suggestions into final *Pre-Design Water Quality Study* report.
        - Study will include:
            - Description of impacted stream length and boundary of impacted area

        - Chemical, physical, and biological water quality data
        - Maps
        - Photographs
        - Suggested polluted coal mine drainage treatment technologies for each source or combined sources and/or stream
    - Submit pre-design *Water Quality Study* report to Abandoned Mine Lands Design Administrator.
    -
    - Update Stream Restoration Project Log.
        - Record name and date pre-design *Water Quality Study* report was sent.

XVII. Establish *post construction focus area monitoring network* when polluted coal mine drainage treatment is complete in the *focus study area*. (If initial *study area* contains other impaired tributaries which have not been addressed, repeat IX through XIV.)

- Locate constructed polluted coal mine drainage treatment systems within polluted coal mine drainage treatment projects.
    - Receive notification of polluted coal mine drainage treatment project construction completion date from Abandoned Mine Lands Construction Administrator.
        - Update Stream Restoration Group Water Quality Assessment Index.
            - Include construction completion date, name of contractor, and construction cost.
    - Field review polluted coal mine drainage treatment project site with Abandoned Mine Lands Project Inspector.
        - Obtain project map.
        - Establish project boundaries.
        - Establish untreated and treated source sampling stations.
        - Number untreated and treated source sampling stations.
            - Number untreated source sampling stations as previously designated for pre-design *Water Quality Study*.
            - Number treated source sampling stations in ascending order beginning with the station nearest to the untreated station.
        - Complete Stream Restoration Group Acid Mine Drainage Assessment (AMDA) Form.
            - Record field notes.
            - Sketch and photograph project area.
- Select and number stream sampling stations throughout *focus study area*.
    - Select the previously impaired tributary sampling stations at mouth location and at extensive locations throughout the tributary stream reach, including stations upstream and downstream of polluted coal mine drainage treatment project influx.

- Select receiving stream sampling stations upstream and downstream of the confluence with the previously impaired tributary.
- Number all stream sampling stations as previously designated for pre-design *Water Quality Study*.

- Update Stream Restoration Group Water Quality Assessment Index (WQAI).
  - Include water quality assessment type and number of monitoring points.

XVIII. Obtain coordinates and map *post construction focus area monitoring network* for Geographical Information System (GIS) input.

- Process Global Positioning System (GPS) Data:
  - Collect positions for any sampling stations added since pre-design *focus area monitoring network* was established using Global Positioning System data capture equipment.
  - Update Stream Restoration Group Project Log.
    - Record project name and date of Global Positioning System coordinate collection.
  - Correct Global Positioning System data.
  - Enter Coordinates into Q&A database.
  - Update Stream Restoration Group Project Coordinates Log
    - Record project name and nomenclature; sample number, latitude, and longitude; and horizontal precision.
  - Provide Q&A database to TAGIS for Geographical Information System (GIS) analysis.
  - Generate project map of all sampling stations.

XIX. Implement sampling sweeps of *post construction focus area monitoring network*.

- Conduct *Water Quality Study* sweeps six times per year during the initial first year period; four times during the second year period; and two times per year during the third and every subsequent year period spanning a range of hydrologic and climatologic conditions.
  - Prepare chain of custody (COC) form for laboratory.
    - Chain of Custody form includes project nomenclature and name, project reclamation number, station number and description, and required field and laboratory analyses.
      - Stream sampling variables include: flow; field temperature, pH specific conductivity and dissolved oxygen; lab pH, specific conductivity, total hot acidity, alkalinity, sulfate, total iron, calcium, aluminum, and manganese.
      - Untreated pollution source sampling variables include: flow; field temperature, pH, specific conductivity, and dissolved oxygen; lab

pH, specific conductivity, total hot acidity, alkalinity, sulfate, total iron, ferrous and ferric iron, calcium, aluminum, and manganese.
    - Treated pollution source sampling variables include: flow; field temperature, pH, specific conductivity, Oxygen Reduction Potential, and dissolved oxygen; lab pH, specific conductivity, total hot acidity, alkalinity, sulfate, total iron, ferrous and ferric iron, calcium, aluminum, and manganese.
- Prepare sampling equipment for field use.
    - Calibrate electronic field equipment.
    - Gather all necessary equipment, forms, maps, keys, and personal needs for sampling.
- Prepare sampling stations for water sample collection.
    - Stake stream and source sampling stations as close to collection point as possible.
        - Label stake with sampling station number.
    - Dig collection basin at pollution source origin.
- Perform water sample collection.
    - Collect stream water sample for laboratory analysis employing "grab" sample method. Sample is collected in the middle of the stream channel, at mid depth, downstream of mixing zone of any influx.
        - Label collection bottle with sample station nomenclature and number, date and time, and preservative.
        - Collect and refrigerate unpreserved water sample for laboratory analyses of pH, specific conductivity, total hot acidity, alkalinity**,** and sulfate.
        - Collect nitric acid preserved water sample for laboratory analyses of total iron, aluminum, calcium, and manganese.
    - Collect untreated source water sample at origin if possible.
        - Label collection bottle with sample station nomenclature and number, date and time, and preservative.
        - Collect and refrigerate unpreserved water sample for laboratory analyses of pH, specific conductivity, total hot acidity, alkalinity**,** and sulfate.
        - Collect nitric acid preserved water sample for laboratory analyses of total iron, aluminum, calcium, and manganese.
        - Collect and refrigerate hydrochloric preserved water sample for laboratory analyses of ferrous and ferric iron.
            - Ferrous and ferric iron analyses are not necessary at source stations when the water is impounded and the origin of the source is not "free flowing" accessible.
    - Collect treated source water sample at polluted coal mine drainage treatment system outflow.
        - Label collection bottle with sample station nomenclature and number, date and time, and preservative.

- Collect and refrigerate unpreserved water sample for laboratory analyses of pH, specific conductivity, total hot acidity, alkalinity**,** and sulfate.
- Collect nitric acid preserved water sample for laboratory analyses of total iron, aluminum, calcium, and manganese.
- Collect and refrigerate hydrochloric preserved water sample for laboratory analyses of ferrous and ferric iron.
  - Ferrous and ferric iron analyses are not necessary at polluted coal mine drainage treatment system stations where the water is aerated.

- Perform field measurements.
  - Obtain insitu water quality measurements at all sampling stations.
    - Measure temperature, pH, specific conductivity, and dissolved oxygen at all stream sampling stations.
    - Measure temperature, pH, specific conductivity, and dissolved oxygen at untreated source sampling stations.
    - Measure temperature, pH, specific conductivity, Oxygen Reduction Potential, and dissolved oxygen at treated source sampling stations.
      - Oxygen Reduction Potential and dissolved oxygen are not necessary at polluted coal mine drainage treatment system stations where the water is aerated.
  - Obtain stream flow.
    - Measure uniform width segments of the total water cross section utilizing a tagline.
      - Each segment should represent no more than 10 percent of the total cross section of the water in the channel.
    - Record average width of segments (tenths of feet).
      - Average width = (distance from previous measurement point + distance to next measurement point ÷ 2)
    - Measure water depth at the water edges and at each uniform width segment between, utilizing a self adjusting wading rod.
    - Record water depth (tenths of feet).
    - Measure water velocity at water edges and at each uniform width segment between, utilizing a Marsh-McBirney flow meter.
    - Record velocity (feet per second)
    - Calculate and record total flow (cubic feet per second).
      - Σ (average width x depth x velocity) = flow
  - Obtain treated source flow at polluted coal mine drainage treatment system outflow.
    - Measure uniform width segments of the total water cross section utilizing a tagline.
      - Each segment should represent no more than 10 percent of the total cross section of the water in the channel.
    - Record average width of segments (tenths of feet).

        - Average width = (distance from previous measurement point + distance to next measurement point ÷ 2)
      - Measure water depth at the water edges and at each uniform width segment between, utilizing a self adjusting wading rod.
      - Record water depth (tenths of feet).
      - Measure water velocity at water edges and at each uniform width segment between, utilizing a Marsh-McBirney flow meter.
      - Record velocity (feet per second)
      - Calculate and record total flow (cubic feet per second).
        - Σ (average width x depth x velocity) = flow
  - Complete Acid Mine Drainage Assessment (AMDA) Form.
    - Record field notes.
    - Sketch and photograph sampling station.
  - Update Stream Restoration Group Project Log.
    - Record project name, date of collection, number of samples, number of sampling personnel, hours sampled, hours traveled to site, downstream flow measurement.
    - Include project status for source sampling stations.
  - Update Stream Restoration Group Water Quality Assessment Index (WQAI).
    - Add monitoring starting date.
  - Report any anomalies noticed at the project during routine monitoring to the Abandoned Mine Lands Construction Administrator.
  - Cease sampling of project if it requires maintenance or modifications unless otherwise instructed by the Abandoned Mine Lands Construction Administrator.
  - Resume monitoring of project upon notification from Construction Administrator of project maintenance completion.
    - Notification should include explanation of maintenance and any modification that could affect *focus area monitoring network*.

- Conduct *Biological and Physical Study* one time between April and November, at least one year after completion of project construction.
  - Perform stream habitat assessments and qualitative benthic macroinvertebrate surveys upstream and downstream of polluted coal mine drainage treatment project influx.
    - Habitat assessment and benthic macroinvertebrate survey comply with United States Environmental Protection Protocol II or Izaak Walton League of America Save Our Streams Protocol.
  - Update Stream Restoration Group Project Log.
    - Record project name and date of bioassessment.

XX. Implement sampling sweeps of the *comprehensive monitoring network*. (If polluted coal mine drainage treatment is complete throughout initial *study area* continue. If additional *focus study areas* will be addressed skip to XXI.)

- Conduct *Water Quality Study* sweeps three to six times spanning a range of hydrologic and climatologic conditions.
  - Utilize chain of custody (COC) form prepared for laboratory during initial monitoring of the *comprehensive monitoring network*.
    - Chain of Custody form includes project nomenclature and name, station number and description, and required field and laboratory analyses.
      - Stream sampling variables include: flow; field temperature, pH, and specific conductivity; lab pH, specific conductivity, total hot acidity, alkalinity, sulfate, total iron, aluminum, and manganese.
  - Prepare sampling equipment for field use.
    - Calibrate electronic field equipment.
    - Gather all necessary equipment, forms, maps, keys, and personal needs for sampling.
  - Prepare sampling stations for water sample collection.
    - Stake sampling stations as close to collection point as possible.
      - Label stake with sampling station number.
  - Perform water sample collection.
    - Collect stream water sample for laboratory analysis employing "grab" sample method. Sample is collected in the middle of the stream channel, at mid depth, downstream of mixing zone of any influx.
      - Label collection bottle with sample station nomenclature and number, date and time, and preservative.
      - Collect and refrigerate unpreserved water sample for laboratory analyses of pH, specific conductivity, total hot acidity, alkalinity**,** and sulfate.
      - Collect nitric acid preserved water sample for laboratory analyses of total iron, aluminum, and manganese.
  - Perform field measurements.
    - Obtain insitu values of water quality measurements at all sampling stations.
      - Measure temperature, pH, and specific conductivity.
    - Obtain stream flow.
      - Measure uniform width segments of the total water cross section utilizing a tagline.
        - Each segment should represent no more than 10 percent of the total cross section of the water in the channel.
      - Record average width of segments (tenths of feet).
        - Average width = (distance from previous measurement point + distance to next measurement point ÷ 2)

- Measure water depth at the water edges and at each uniform width segment between, utilizing a self adjusting wading rod.
- Record water depth (tenths of feet).
- Measure water velocity at water edges and at each uniform width segment between, utilizing a Marsh-McBirney flow meter.
- Record velocity (feet per second)
- Calculate and record total flow (cubic feet per second).
  - Σ (average width x depth x velocity) = flow

- Complete Stream Restoration Group Acid Mine Drainage Assessment (AMDA) Form.
  - Record field notes.
  - Sketch and photograph sampling station.
- Update Stream Restoration Group Project Log.
  - Record project name, date of collection, number of samples, number of sampling personnel, hours sampled, hours traveled to site, and downstream flow measurement.

- Conduct *Biological and Physical Study* one time between April and November.
  - Perform stream habitat assessments and qualitative benthic macroinvertebrate surveys at all stream sampling stations.
    - Habitat assessment and benthic macroinvertebrate survey comply with United States Environmental Protection Rapid Bioassessment Protocol II or Izaak Walton League of America Save Our Streams Protocol.
  - Update Stream Restoration Group Project Log.
    - Record project name and date of bioassessment.
  - Perform fish survey at selective stream sampling stations only.

XXI. Review data.

- Analyze changes in stream water quality.
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- Analyze effectiveness and efficiency of constructed polluted coal mine drainage treatment systems.
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XXII. Report findings.

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- Prepare final post construction *Water Quality Study* report.
  - Determine the effect of constructed polluted coal mine drainage treatment systems on the polluted coal mine drainage sources, *focus area monitoring networks*, and *comprehensive monitoring network*.
    - Study will include:

- Introduction and History of Project
- Drainage Area
- Sampling protocol
- Water Quality Data
- Mapping
- Personnel Involved
- Photos
- Design Construction Map
- Materials used for Construction
- Construction Cost
- Time Frame
- Water Quality Improvements:
    - Acid Reduction through Project
    - Metal Reduction through Project
    - Reduction in Acid Load to Receiving Stream
    - Biological Assessment, (Upstream verses Downstream)
- Graphs and Charts
- ARC View Pictorials

- Submit final post construction *Water Quality Study* report to Abandoned Mine Lands Chief, Design Administrator, Construction Administrator, Project Engineer, Stream Restoration Group Supervisor, In-House Design Administrator, and File.

XXIII. If polluted coal mine drainage treatment is complete return to I. If additional *focus study areas* will be addressed return to IX.